FIRST AID
IN THE
FACTORY

Lord Taylor and his colleagues in the Harlow Industrial Health Service have approached industrial first aid in a new way They started by studying what first aiders actually do in factories and other work places They deliberately omitted all that was obsolete and irrelevant in current first aid teaching and have concentrated on the practical detailed care of the accidents and illnesses which occur in industry

Special attention is devoted to injuries of the hands feet and eyes and wound cleaning and protection from oil and solvents Modern methods of dealing with *shock fractures gassing and chemical splashes* are fully considered The care of the unconscious patient and simple methods of transport of the injured are explained and illustrated The statutory duties of the first aider and the statutory contents of industrial first aid boxes are dealt with

Loss of working time in industry as a result of the inadequate care of minor injuries and accidents is far greater than the loss from industrial disputes As a result both industry and government are paying increasing attention to the need for efficient industrial first aid This book is the first attempt to meet fully the needs of those who learn teach and practice industrial first aid



MEDICAL WORLD HANDBOOK

FIRST AID IN THE FACTORY

and on the building site and farm in the shop, office and warehouse

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FOREWORD

In a society which lives by industrial production the health of those who work is a national asset Proper health care in the factory or other work place demands efficient first aid The purpose of this book is to set out in a simple and practical way exactly what the industrial first aid worker has to know and do

The importance of good first aid has long been realised in Britain by those con cerned with providing industrial health services Two pilot surveys of industry undertaken by the factory inspectorate in Halifax* and Stoke on Trent† clearly showed the need for official action They revealed not only an overall lack of people trained in industrial first aid but also the inadequacy and inefficiency of first aid facilities in many work places

On the recommendation of the Industrial Health Advisory Committee the Minister of Labour has now taken action to stimulate the recruitment and training of factory first aid workers and to bring the contents of first aid boxes up to modern standards ‡ The first aid worker has been given the tools He must now be taught when and how to use them Lord Taylor and his colleagues have shown how this can be done Their book will do much to ensure that the necessary standard of training and skill is attained It is therefore a valuable contribution to the national economy Moreover it may well prove useful in countries overseas especially those in the earlier stages of industrial development

Factory first aid differs from conventional first aid in many respects not least because the first aid worker in industry often has to accept full responsibility for the initial treatment of a large number of cases of illness and injury While his limitations must be recognised in that he has neither the qualifications nor the training of the medical officer or nurse he is in the front line of the fight against industrial ill health on his efficiency and initiative much of the success of the supporting arms will depend

It is estimated that each year in this country there are some forty million indus trial accidents which require treatment The great majority of these are compara tively minor But the importance of prompt and skilled treatment for the most trivial injury cannot be over emphasised if disability suffering and loss of working time are to be avoided

There will always be some diversity of opinion as to details of treatment But if the basic principles which are so clearly defined in this book are understood and practised it will have achieved its object

Lord Taylor and his colleagues through their work in the Harlow Industrial Health Service have had practical experience of the standard of first aid which is required particularly in small firms They are to be congratulated on the highly successful way in which they have carried out a by no means easy task for the benefit of all who are engaged in industry

A AUSTIN EAGGER

Slough Industrial Health Service

Industrial Health A Survey n Halifax HMSO 1958
† Industr l Heal h A Survey of th Pottery Industry in Stoke-on Tr t HMSO 1959
A ual Report of th Chief In pector of F ctories HMSO 19 9

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The St John and St Andrew s Ambulance Associations and the British Red Cross whose tireless efforts have built up a wonderful public enthusiasm for the practice of first aid

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Chapter 1

A New Look at an Old Topic

For many years first aid has been the Cinderella of the health services a poor relation of nursing and minor surgery While the science of medicine has been advancing at break neck speed first aid has stood still drably dressed in garments long out of fashion It is high time Cinderella went to her first modern dancing class

There is no reason why first aid should be dull and dowdy Approached in the spirit of scientific inquiry it presents a fascinating series of problems for both learner and teacher It is an exercise in social behaviour applied medicine and surgery and teaching method The account given here of first aid in the factory is not in any sense final First aid must advance with the advance of medicine itself and we feel sure that even in the light of existing experience what we have to say can be bettered in many ways But if we only unlock the straitjacket of the past we shall have done our job

It all started by chance When we set out to create a group industrial health service we found we needed first aiders We found that we had to supply and stock first aid boxes in small factories We were shocked at some of the things the law compelled us to put in these boxes so as a first step we set out to discover what first aiders in industry really have to do In modern technical jargon we started with a work study or job analysis We soon found too that existing teaching bore little relation to the industrial first aider s actual needs So we had to work out a new scheme of teaching directly related to the situations which face the first aider in the factory shop or office on the building site or the farm

In every factory or work place first aiders have a real part to play But the emphasis of their work is different from for example first aid on the roads

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Fig 1 *The first line of defence in health care in industry is the trained factory first aider with the appropriate equipment*



Fig 2 *The second line of defence the industrial nurse here seen at work in the foreman s office in a small factory*

The three organisations have also combined to organise a course on occupational first aid leading to an occupational first aid certificate This course does not modify the clinical teaching of the parent bodies but rather supplements it with some knowledge of industrial safety record keeping legislation and the organisa tion of accident services in major emergencies If such knowledge succeeds in making industrial first aiders ambassadors of health in the factory it will have been worth acquiring

There is the possibility however that factory first aiders may tend to be treated as alternatives to proper industrial nurses and safety officers This would be a disaster both for the patients and for the first aiders themselves First aiders semi skilled in industrial nursing and safety work would inevitably be doing second class jobs The industrial first aider must be nothing less than first-class this he can be only if the limits of his job are clearly defined

After we had worked out the form and content of our teaching we were strengthened in our conclusions by the discovery of *Fundamentals of First Aid* by Dr R A Mustard FRCS(C) of the Toronto General Hospital the official first aid text book of the St John Ambulance organisation in Canada We agree almost entirely with the clinical conclusions of our Canadian colleague and we shall have occasion to quote some of these conclusions

We are by no means convinced of the value of first aid competitions in the teaching of industrial first aid Competitions are largely team activities and first aiders in smaller factories have to work on their own and think for themselves

Conventional first aid courses devote much space to the control of serious haemor rhage fractures of the long bones and other forms of severe injury Happily, in industry serious accidents are comparatively rare when they do occur the first aider must know what to do and how far to go But expert help is usually so quickly available that heroic first aid is seldom needed

The day to-day picture of first aid in the factory is rather a stream of minor injuries and minor ailments small cuts and burns colds and headaches Many of these the first aider will have to treat himself and they will never be seen by a trained nurse or a doctor *In so doing he is stepping beyond conventional first aid* he is in fact giving full treatment At first sight this may seem wrong to the doctor or to the trained nurse But pause and think for a moment In the home the mother treats the small cuts and headaches of the family if she did not do so the health services would break down under the strain There are close on a quarter of a million factories in Britain and 200 000 of them employ fewer than 25 workers A nurse or a doctor for each little cut at work is manifestly absurd So in the factory the first aider comes into his own

In undertaking full treatment of minor injuries and ailments the first aider is shouldering a serious responsibility He must know his job and his limits and when to call for help Given this knowledge and given the tools he needs for the job he is the real first line of defence in the health care of his workmates In our experience all too often he has neither the knowledge nor the tools Here we set out to describe the tools he ought to have and the basic essentials he must know With these he will be able to do properly what he is already forced to do as an unskilled amateur

Present Teaching

For many years training in first aid has been carried out bravely and earnestly by the St John Ambulance Association the British Red Cross Society and the St Andrew s Ambulance Association Certificates have been issued and competitions promoted and the great network of enthusiastic voluntary workers have pursued their activities with an almost religious fervour Though we hope that the scope of their teaching may change in certain respects we do not expect to see the develop ment of any alternative nation wide teaching network Indeed those who have been basically trained by these organisations are good raw material for factory first aiders. But we find that they have to acquire a rather different approach if they are to play a proper part in modern industrial medicine

Recently these three great organisations have together produced a joint authorised first aid clinical manual This is a major improvement on its predeces sors and for those who wish to learn much more than is taught here it can be recommended There are however many thousands of copies of the old and obsolete manuals still preserved in factory first aid boxes These should be firmly discarded. In our experience even the new manual does not meet the needs of the industrial first aider In elementary anatomy and physiology in bandaging and splinting he needs to know less and in the treatment of minor injuries and ailments and the special hazards of industry he needs to know more than is taught in it.

5 First aiders are called upon to think for themselves but not to make precise diagnoses of all major conditions They are incompetent to do so and to make the attempt may be dangerous to the patient Their first task is to decide quickly whether a particular illness or injury is or is not within their power to treat. They will do this all the better if their minds are not befogged with medical inessentials

6 There are a number of time honoured first aid treatments often very complicated whose value is to say the least open to doubt They form no part of the curriculum of modern medicine and in our view are best dealt with by purposeful omission

7 Practical medicine is built on the hypothesis of calculated risk. Quite unconsciously the doctor in his daily practice is continually making use of the theory of probabilities He decides on the probable diagnosis and acts accordingly If he set out to exclude every improbability he would block the hospital machine and his patient might die in the interim First aid must be taught and conducted on the same basis The first aider must be sure of the correct way of dealing with the common injuries The same way may not be quite right for the rare complicated contingency But it is better to accept this slight risk than so to burden the first aider with complications that he becomes confused when facing the common situation

In *Fundamentals of First Aid* Dr Mustard gives the following example of calculated risk

> A patient is unconscious from a blow on the head. The essential treatment is to get the patient over into the prone or semi prone position so that the airway is kept clear by the tongue falling forward and any vomit or saliva running out instead of back into the lung This simple step may save many lives
>
> But one in a thousand of such patients *may* also have sustained a fractured spine which injury *may* be made worse by movement into the semi prone position Nevertheless to confuse the teaching by introducing this improbable complexity is more likely to lead to bad treatment of the many than good treatment of the few

The First aider in the Industrial Health Team

The factory first aider is a front line fighter in the battle for health But he cannot do his job without proper support This means he ought to be a part of an organised industrial health service Such a service already exists to a greater or lesser degree in most large firms Here trained nurses are usually on duty throughout the main working periods with doctors available or on call In medium sized and smaller factories however this is still rare Only about 1 per cent of all factories employing fewer than 250 people have any proper medical services although they contain more than half the factory population Small factories cannot afford the overheads involved and the volume of work such a factory throws up would not justify a full time nurse The answer is that a number of such factories should combine to provide an industrial health service on an area basis

The Nuffield Provincial Hospitals Trust has sponsored three such area health services – on the Slough Trading Estate at Harlow New Town and in the Central Middlesex area These services provide patterns for the future broadly similar but differing in detail At Slough the medical staff are whole time at Harlow they are the general practitioners of the town serving on a part time sessional basis The

Competitions may well be helpful in recruitment and in the training of ambulance workers But there is a risk that they may produce a certain rigidity of mind and procedure which is not in the best interests of the patient

On the other hand individual examination of the first aid worker at the end of a teaching course is essential But we deprecate a rigid examination framework If the teacher is to be trusted to teach and conduct an examination he should also be trusted to frame the questions and decide whom to pass or fail. We find that a twenty minute viva voce and practical examination gives a fair picture of the first aider s capacity Two examiners working together are better than one a doctor and a trained industrial nurse make a good combination

General Propositions

We base our teaching on certain general propositions and assumptions

1 Factory first aid differs from conventional first aid in several important ways

a The number of patients the first aider can expect to treat is much greater A factory first aider may deal with five ten or twenty people in the course of a day By contrast a first aider in the home or on the road may not even have to use his skill once a month

b The nature of the work is different There are special risks and dangers which have to be dealt with in special ways Above all there is the stream of minor injuries to be coped with The factory first aider has to become a specialist in the proper treatment of minor injury

c Dressings and other material needed for proper treatment are or always should be at hand There is therefore little need for improvisation

d In almost all large factories and in an increasing number of medium sized and small factories skilled nursing help or medical help is immediately available or readily called if necessary Except in the more remote places an ambulance can be got in a matter of minutes and a hospital reached within half an hour or so Faced with a situation beyond his capacity the industrial first aider need not be alone for long Even in the smallest work place he is not really working in isolation but is one of a team With any condition other than a minor injury or ailment he has only to know what to do until the trained nurse doctor or ambulance can be obtained

2 It is not our objective to make the factory first aider into a skilled ambulance worker The ambulance worker is a specialist in his own right in the transport of the severely injured

3 As industry changes workers have to develop new skills Technical ability in physics chemistry or biology is becoming an everyday industrial requirement Increasingly the old fashioned first aider who worked by rote is being replaced by a white coated technician who is quick to criticise faulty reasoning behind any procedure Vague and imprecise talk of germs and antiseptics by the teacher will be quickly detected and exposed

4 The factory first aider is not and never should be a semi skilled doctor or nurse The medical teacher has to shake himself free from the way he himself was taught as a student. Unnecessary technical terms and theoretical knowledge must be jettisoned Simplicity is far more important than fuddled comprehensiveness

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FIG 4 *The fourth line of defence is the factory doctor Here he is holding a consultation about a health ha ard on the factory floor*

doctors and nurses must be fully mobile Yet it will never be possible for them to be everywhere when they are needed So the industrial first aider on the floor of the shop is essential He will be the first to see almost every industrial casualty He will himself deal with a defined range of minor casualties So his judgment is the first vital link in the chain of efficient industrial medical care The most important single lesson he has to learn is when to pass on a patient or call for help The doctor has to learn this too and the industrial nurse also Everyone of us has his limitations and success in all medical work depends on our capacity to recognise them We must have no obstinacy or false pride The first aider who has to stand on his own in the small factory should at least have a doctor or group of doctors on whom he can call or he must be ready to send on everything beyond his capacity to the casualty department of the local hospital We look forward to the day when first aiders everywhere will be associated with local or area industrial health services or with fully staffed factory medical departments

Exponent of Health and Safety

Besides playing his part in treatment the factory first aider has another function He should be an exponent of health and safety on the factory floor Nowadays it is almost a platitude to say that all workplaces should be healthy safe and happy as well as vigorous and productive Work ought to be enjoyed Professional grumblers and carpers are producers of collective mental ill health Nevertheless critical observation is constantly necessary In the best regulated factory accidents will still

Harlow arrangement means that the same group of doctors look after the patients at work and in their homes but the administration of such a service is inevitably more complicated

Such group industrial health services bring to the workers in smaller factories the same level of industrial medical care as is enjoyed by workers in the very largest firms Each member factory contributes financially according to the number of its employees so that a firm with perhaps only 20 workers can always have available a service which is paid for on behalf of 4 000 or more workers

Pattern of Organisation

The group pattern of organisation is an adaptation of the physical pattern which exists in any large factory

1 At the hub is an industrial health centre or factory medical department staffed with trained nurses with doctors swiftly available and open during ordinary working hours There are special arrangements for night and week-end cover

2 The larger work places have medical treatment rooms staffed by trained nurses either continually or for regular sessions

3 In the medium sized work places there are first aid posts or rooms with first aid boxes and other equipment Trained nurses visit regularly or as required

4 In the small work places and in individual shops of larger factories there are first aid boxes only with first aiders in charge

In any substantial industrial health service whether serving one or many factories



FIG 3 *The third defence line is a fully equipped surgery in the factory medical department or industrial health centre*

Moreover every worker should be conscious of the need for good factory house keeping and for the simple measures which can prevent accidents and promote safety in the workshop Every worker should also be aware of the necessity for elementary hygiene if factory lavatories and canteens are to be as clean as they ought to be in the interests of health

But not everyone can practise industrial first aid if they attempted to do so the result would be chaos There must be one first aider responsible for each first aid box for each shift and at least one deputy ready to take over in case of absence or illness It may be that these key first aiders will have had some general training before they learn industrial first aid as taught here But our teaching can stand on its own and the beginner who knows only what is written here will be able to acquit himself well

There is one final proviso In some jobs there are special risks for which special local instructions are needed But the general principles and practice of first aid do not vary with locality It is with the general picture of industrial and occupational first aid that we are now concerned

happen New machines and processes will always be coming along with new risks and hazards to be overcome

It is not our intention here to attempt to teach industrial safety or factory hygiene The St John and Red Cross industrial first aid book has a helpful chapter on industrial safety If he can the industrial first aider should visit the excellent industrial health and safety exhibition centre of the Ministry of Labour * In industry as elsewhere prevention is obviously better than cure and it is better to have prevented an accident than to have treated one But gratuitous advice from the first aider may be resented The most effective time to offer such advice is immediately after an accident has been satisfactorily treated

Learning and Teaching

It is hoped that the picture here presented may be of value both to those who learn and those who teach industrial first aid The needs of the one will not always be quite the same as those of the other in particular the theory behind a particular line of treatment may be essential knowledge for the teacher yet may confuse the taught As far as possible detailed background reasoning and argument, as well as the less common first aid problems and procedures have been set in small print The student can safely omit such sections especially on his first reading

It is assumed that the teacher will make his own lecture synopsis Indeed the teacher who fails to do so will hardly be worth his salt Good first aid teaching is an art which can be learnt only by practice and by trial and error The teacher who talks too much is usually less effective than the teacher who says too little The class must be encouraged to participate but not allowed to get out of hand The exhibitionist must be firmly shut up and the shy ones allowed to have their say Above all the class must do things for themselves

In all teaching repetition is of immense importance The advice of the wise old lay preacher may be recalled First, I tells em what I m going to say Then I says it. Then I tells em what I ve said Throughout there is some deliberate repetition The informed critic must forgive this It is part of the teaching process

Besides knowledge the good first aider must acquire certain qualities of behaviour Indeed he can only apply his knowledge effectively when these qualities have become a part of his approach to every patient.

The good first aider must be careful in his observations accurate in his interrogation honest in his judgment ready to admit mistakes and learn from experience clean systematic and gentle in his treatment and quiet unanxious and unhurried in his demeanour He will do well moreover to re read and ponder this list of qualities at the end of his course

Who Should Learn Industrial First aid?

It is worth considering how many first aiders there should be in factories of different sizes and whether or not every worker in industry should receive some elementary teaching in first aid In our view everyone in industry should be at least as familiar with elementary first aid as is the fighting soldier in wartime

* The address of the exhibition centre is 97 Horseferry Road London SW1 Open 10 a m to 5 p m from Monday to Friday and on Saturday 10 a m to 1 noon

Moreover every worker should be conscious of the need for good factory "house keeping" and for the simple measures which can prevent accidents and promote safety in the workshop. Every worker should also be aware of the necessity for elementary hygiene if factory lavatories and canteens are to be as clean as they ought to be in the interests of health.

But not everyone can practise industrial first aid: if they attempted to do so the result would be chaos. There must be one first aider responsible for each first aid box for each shift, and at least one deputy ready to take over in case of absence or illness. It may be that these key first aiders will have had some general training before they learn industrial first aid as taught here. But our teaching can stand on its own, and the beginner who knows only what is written here will be able to acquit himself well.

There is one final proviso. In some jobs there are special risks, for which special local instructions are needed. But the general principles and practice of first aid do not vary with locality. It is with the general picture of industrial and occupational first aid that we are now concerned.

Chapter 2

The First-Aider's Tools

The first aider in the factory starts with an advantage over his colleagues else where The law lays down that he must be provided with tools for the job Depend ing on the number of workers in the factory the minimum contents of the first aid box are specified

First aid Boxes

We shall call the three box types A B and C (not the official nomenclature)

Box A is for factories with *up to* 10 *workers*

Box B is for factories with *11 50 workers*

Box C is for factories with *more than* 50 *workers*

Experience at Harlow and elsewhere suggests that the boxes could be improved by certain additions and omissions and official revision of first aid box contents has recently been completed * Nevertheless most of the basic items are sound In particular the official sterilised individual dressing is still the best emergency dressing as a prelude to removal for treatment elsewhere

The classification of box size on the basis of the number of workers at risk is a guide to minimum needs only Some types of work produce very few minor inju ries other types have a heavy minor casualty rate In consequence the latter will use up first aid supplies far quicker than the former

Most boxes supplied commercially have fronts which let down to provide a work space for the first aider This is a good arrangement unfortunately the supporting chains are usually far too flimsy Wooden boxes are superior to those made of tin as the metal is more inclined to warp

Internally every box should have a space in which bottles can be kept upright This space must be at least 10 inches in height if it is to contain 20 oz bottles We recommend a minimum space of 10 inches by 6 inches by 4 inches for 20 oz bottles and 8½ inches by 5 inches by 4 inches for 10 oz bottles Boxes supplied commercially seldom have this space consequently in most small factories dust covered bottles decorate the top of the first aid box The Harlow recommended box is shown in *Fig 5* By law the box must be plainly marked First Aid"

The Sterilised Individual Dressing

The official sterilised individual dressing (*Fig 6*) is made in three sizes *small* – for injured fingers (No 7) *medium* – for injured hands or feet (No 8) and *large*

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FIG 5 *Standard first aid box in use at Harlow Note the let down front the special space for tall bottles the official individual dressings packed on the top shelf and the items of equipment mentioned in the text*

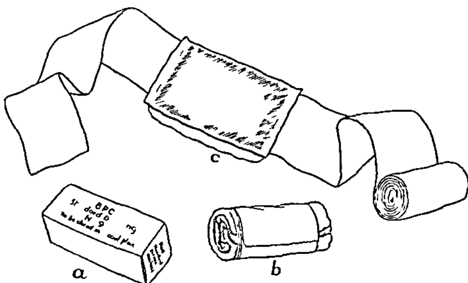


FIG 6 *Official sterilised individual dressing (a) boxed (b) unboxed and (c) open Note the pad which must not be touched during application attached to the roller bandage*

for other injured parts (No 9) It is similar to but not identical with the Shell Dressing or First Field Dressing issued to soldiers as an emergency dressing in wartime

The dressing consists of a thick absorbent pad with a layer of lint or preferably gauze on the side to be applied to the wound and a roller bandage stitched to the other side The whole forms a small roll which is wrapped in paper and enclosed in a cardboard box The dressing itself inside the paper is sterilised Sometimes the pad is medicated this is unnecessary and undesirable When the paper covering *has been torn off the bandage will be found to be rolled in such a way that the pad* can be applied to a wound without being touched by the hand and so remains germ free This is an excellent true first aid dressing for any wound which is at all extensive or bleeding much as a preliminary to treatment by a trained nurse doctor or hospital As a dressing for small injuries to keep on while at work it is much too bulky

A special version of the sterilised individual dressing is the sterilised burn dressing in this the pad is impregnated with picric acid Knowledge of the proper treatment of burns is rapidly advancing and it is now clear that the application of picric acid or any other antiseptic or crust forming chemical as a first aid dressing does harm rather than good For burns we advise the use of the non medicated simple sterilised individual dressing rather than the sterilised burn dressing

The official minimum supplies of sterilised individual dressings are as follows

	Box A	*Box B*	*Box C*
Small individual sterilised dressings (No 7)	6	12	24
Medium individual sterilised dressings (No 8)	3	6	12
Large individual sterilised dressings (No 9)	3	6	12
Small sterilised burn dressings (No 10) Large sterilised burn dressings (No 12)	a sufficient number		

From what has been said above it is clear that a sufficient number of sterilised burn dressings is none The 1959 regulations endorse this conclusion

Cotton Wool

Boxes have to contain a sufficient supply of sterilised absorbent cotton wool in ¼ oz packets Cotton wool in substantial quantity is occasionally needed by the first aider for padding a splint or mopping up a lot of blood For such purposes the ¼ oz packets have the great merit of cleanliness and convenience We therefore *suggest that each type of first aid box should contain 6 of these packets* The disadvantage of the ¼ oz packet is that this quantity is far too much for most single jobs for example cleaning a wound In consequence the remainder of a package is left about opened it is then no longer sterile and soon gets physically dirty

Small pledgets or pieces of cotton wool are essential for wound cleansing For this purpose a cotton wool strip dispenser as used in barber s saloons is very useful The Harlow model (shown in *Fig 5*) is made from a screw top jam jar with a ¼ inch hole cut in the metal top Clean cotton wool is cut into a ¼ inch strip and packed neatly into the jar the end being threaded through the hole in the top Pledgets can then be pulled off as required We advise that every type of first aid box should contain clean cotton wool in a strip dispenser The regular stocking up of the

dispenser is not a job for the floor of the factory It should be done on a clean table in a clean room by a person with clean hands preferably a trained nurse

If a first aider is to attempt to remove foreign bodies from the eye (this question will be discussed in detail later) cotton wool is needed in one other form The individual applicator consists of a wisp of clean cotton wool wound round an orange stick and stored in an envelope This is a permissible alternative to the corner of the none too clean pocket handkerchief which is still in use in many factories To discourage handkerchief work we include in all types of first aid box 6 such applicators in an envelope each to be used once and thrown away

Adhesive Plaster

The 1959 regulations require a sufficient supply of adhesive plaster in all boxes Adhesive plaster is used in two forms

1 The individual small plaster with a gauze dressing attached Many excellent proprietary varieties are available with the gauze plain or medicated We prefer and recommend plain non medicated gauze

2 The reel of plaster from which strips are cut as required These strips are not normally applied directly to wounds but are used to hold other dressings in place



FIG 7 *The two types of individual small plaster with dressing attached*

In our experience every type of first aid box must contain a large tin of individual adhesive plaster dressings preferably in three sizes * So useful are these in the treatment of small cuts that if they are not provided the workers will produce them for themselves It is sometimes urged that these dressings should not be supplied because of the risk of filching for home use Provided a responsible first aid worker is in charge of each first aid box this need not arise In any event so valuable and time saving are these dressings that the risk of loss is better accepted

The attached gauze dressing may extend from edge to edge of the plaster or it may be central only with a complete surround of adhesive (*Fig* 7) For most purposes we prefer the dressing which stretches from edge to edge this permits the escape of skin moisture and so prevents the development of a soggy skin For the same reason we prefer the non water proof to the water proof plaster On a dirty job the individual small plaster may require frequent changing Rather than do this it may be better to cover the plaster with a short length of ordinary bandage which can then be changed as often as necessary

A reel of sticking plaster is worth its place in the first aid box though it should never be applied directly to a wound without some kind of dressing between it and the injury Its great value is in securing ordinary bandage ends in place

* The 1959 eg lat s a cept th ew a d ssorted dhes wound d ess ngs 12 in Box A 4 in Bo B d 36 n B C w compulsory f m J nuary 1960

Protection from Oil

In many jobs it is necessary to protect a wound from oil particularly cutting oil Oil is not necessarily germ infected indeed some cutting oils contain an added antiseptic Nevertheless oils must be kept away from wounds to prevent their affecting the raw tissues for this may lead to the development of skin sensitivity later Oil also delays healing

The obvious step would appear to be to cover the wound or the dressing with some oil and water proof barrier The barrier has to be water proof as many lubricating fluids have a watery basis To achieve this rubber finger stalls and gloves water proof plasters and self sealing crepe rubber dressing covers have been tried With one or two possible exceptions these all have the serious dis advantage that they retain perspiration producing a soggy skin around the wound and so delay healing At Harlow at present all first aid cabinets contain one 3 inch roll of self sealing crepe rubber which can be used to make an individual fitting finger stall it is included in deference to the wishes of some factory first aiders and we regard it as obsolescent A water tight occlusive covering should remain on only when the patient is actually at work It should be removed on leaving work in the evening and preferably also at the lunch break and re applied at the start of work in the morning or afternoon

Provided it is properly applied and frequently changed the best protection against oil is an ordinary roller bandage applied over some other dressing It will need changing at least three times a day – at the start of work and at the end of the morning and afternoon shifts An oily bandage left in contact with damaged skin overnight predisposes to oil acne and dermatitis

The Roller Bandage

The proper use of the roller bandage can be taught only by demonstration and practice At present the law specifies twelve roller bandages in Box C only * Experi ence has led us to suggest the following quantity

	Box A	*Box B*	*Box C*
Roller bandages – 1 inch	6	9	12
Roller bandages – 2 inches	6	9	12

The 1 inch bandage is suitable for fingers and hands the 2 inch for limbs

In using a roller bandage the first aider should remember the following points

1 Clean the hands before breaking the paper seal

2 Break the paper by grasping in both hands and contra rotating (*Fig* 8)

3 Always work with the bandage rolled Attempts to apply an unrolled bandage soon result in chaos

4 Keep the coil of unused bandage close to the part being bandaged and pull firm after each turn There is a difference between pulling *firm* and pulling *tight* – which can be taught only by demonstration and learnt by practice

5 Do not apply too much bandage

6 The correct way of tying a bandage must also be taught by demonstration The bandage end is nicked with scissors split for about a foot and knotted once to

* In the 1959 g l t ons oll b nd ges e om tt d wh h s n eal r H lf of th rolle b nd g a d d d al te l sed d g m y be k pt in serve bo lose t ha d

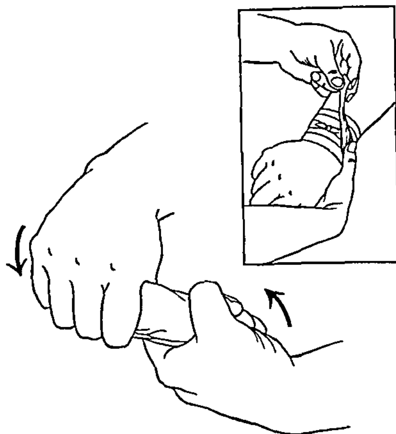


FIG 8 *Breaking the cover of a roller bandage by grasping and contra rotating the hands* FIG 9 (inset) *Covering the knot and ends of a bandage with adhesive plaster to prevent their catching in machinery*

prevent further splitting Bandages round the fingers hand or forearm will usually be tied Bandages round the arm or leg will usually be fixed with a safety pin

7 The split bandage ends should be tied with a reef knot and the ends cut short to prevent their catching in machinery The knot and ends are then best covered with a piece of adhesive plaster (*Fig* 9) Some advocate fixing the bandage with strapping alone without a knot in our experience this is not safe

8 Unused roller bandage should be fixed with a pin and carefully preserved for future use

There are special methods of bandaging the knee and elbow shoulder and ankle scalp ear and eye In our view the first aider in the factory will never have to undertake these complicated manoeuvres He will usually deal with these types of injury by using a sterilised individual dressing and will then refer them for further treatment to a nurse or doctor The idea that bandages must be applied from the extremities of the body working towards the heart is an outdated myth

The Triangular Bandage

The 38 inch triangular bandage is 38 inches along each of its two shorter sides It is made by cutting diagonally a square piece of linen or calico The present official requirement is 6 triangular bandages in Box C only The 1959 regulations specify 2 triangular bandages in Box A 4 in Box B and 8 in Box C

The triangular bandage may be used either as a bandage for holding a dressing or a splint in place or as a sling The first aider with a supply of individual sterilised dressings will not need to use it for holding dressings in place

To hold splints in place it is folded on itself three times (*Fig* 10) to produce a stout narrow binder Further details will be considered under fractures

Used as a sling the right angle of the triangle should point outwards behind and beyond the elbow and the front layer of the sling should pass over the shoulder on the injured side (*Fig* 11) To sling the arm at an angle of 45 degrees the triangular bandage folded narrow may be used as a " collar and-cuff sling This is essentially no more than a clove-hitch round the wrist (*Fig* 12) Slings can be improvised with safety pins a neck tie or simply by using the jacket (*Fig* 13)

Tulle Gras Dressing

Factory first aiders often ask for a small soothing dressing which can safely be applied to burns and which will not stick especially since the use of acriflavine emulsion has been discouraged For this purpose we recommend the individual sterilised tulle gras dressing contained between two slips of transparent paper stored in a small tin Tulle gras is curtain netting impregnated with petroleum jelly At Harlow twelve such dressings are included in Boxes A B and C

Splints

By law suitable splints with cotton wool or other padding have to be included in Box C Quite rightly these vanish in the 1959 regulations Splints are easy to improvise and often the best splint is the human body itself Nevertheless on occasion a few pieces of wood may be useful The theory of splinting in first aid will be discussed when fractures are considered

Other Statutory Requirements

Boxes A B and C must each contain a tin of safety pins of assorted sizes as well as a copy of Form 1008 – a single sheet outline of first aid (price 2d or 3s for 50)

If the practice recommended here is adopted the following items which still have to be stocked for statutory reasons will soon lapse into harmless disuse *

> *In boxes A B and C* – Iodine (2 per cent) in alcoholic solution *or* Gentian violet (1 per cent) in water Sal volatile solution in dark bottle with dose on label
> *In Boxes B and C* – Oily cocaine eye drops (Factory Department Formula No 1) with camel hair brush in the cork
> *In Box C* – Tourniquet

The reasons why we regard each of these as obsolete will be given later Eye

* The 1959 regulations omit these items but specify a rubber bandage or [illegible] bandage for all boxes We regard this as unnecessary

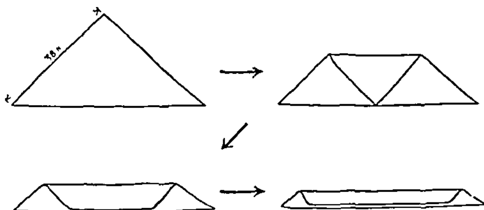


Fig 10 *Folding a triangular bandage on itself three times to produce a stout narrow binder*

Fig 11 *The triangular bandage used as a sling Note that the right angle of the triangle points outwards beyond the injured elbow and that the front layer of the sling passes over the shoulder on the injured side*

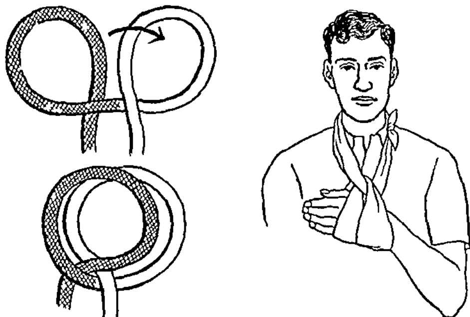


FIG 12 (Left) *How to make a clove hitch* (Right) *The triangular bandage folded narrow and used as a collar and cuff sling The cuff is a clove hitch*

ointment and eye pads are now finding favour in official circles * In our view the first is undesirable and the second unnecessary as an eye can always be covered temporarily with a medium sized sterilised individual dressing

The Harlow Supplement

To carry out the treatments recommended here certain other items are needed In compiling this list we have studied carefully what good first aiders are already doing and are expected to do in industry Each item will be discussed later

- Cetrimide (1 per cent) either two 10 *oz* bottles or one 20 oz bottle depending on available space in box These bottles should have rubber or glass bungs *not* corks
- Gallipot 2 oz
- Kidney dish 6 inches
- Proprietary non inflammable plaster remover 1 4 oz bottle This is also useful for cleaning oil from the skin around wounds
- *Small unbreakable tumbler*
- Eye bath unbreakable
- Blunt nosed surgical scissors with chain attached The length of chain helps to prevent the scissors getting lost
- Splinter forceps
- Clinical thermometer
- Bismuth and magnesium trisilicate tablets 50
- Aspirin phenacetin and caffeine tablets 50
- Iodised throat tablets 50

It should be mentioned here that after use the gallipot kidney dish tumbler and

* The 1959 egul t o pe fy e t e f ppro ed e o tm nt ll b e d 2 4 nd 8 t r li ed y pads n sepa te al d p ket n Bo es A B a d C pe t ly

eye bath should *always* be washed thoroughly with soap and hot water and dried on a clean towel If this is not done infection may be spread from patient to patient

What To Leave Out

Unless there is a firm discipline many other items soon find their way into the first aid box The result is an inefficient clutter with the essentials for sound work lost in a jungle of inessentials We therefore strongly urge the omission of all items not on the prescribed list In particular we regard the following as unnecessary

Lint gauze or dressings other than those specified above
Proprietary or other antiseptics
Acriflavine solution cream emulsion or proprietary preparations
Mechanically operated eye bath and bottle
Eye lotions pharmacopoeial or proprietary
Tannic acid preparations
Ointments pharmacopoeial or proprietary
Mixtures for internal consumption
Tablets other than those specified above
Styptics
Lotions for external application

Many of these items have a proper role in industrial medicine Before they are used however decisions as to diagnosis which are beyond the proper scope of the

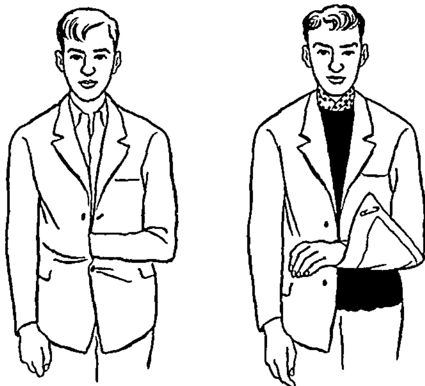


FIG 13 *The jacket used as an improvised sling*



FIG 14 *First aid box well sited in a rolling mill Note the enamel topped table pedal bin and drinking fountain of value for washing out the eye close at hand*

first aider must be made For example stock eye lotions are sometimes prescribed by industrial first aiders for conjunctivitis yet the symptoms of conjunctivitis may be due to many causes requiring as many different treatments the danger here is manifest Moreover stored eye lotions tend to go stale

Siting the First aid Box

Ideally the situation of the first aid box should be as follows

1 The box should be fixed to the wall over a small enamel topped table which should be kept clear and clean

2 There should be a strong chair close at hand on which the patient may sit while being treated

3 There should be a sink with running water soap and towel close by for the

use of both the patient and the first aider A drinking fountain is better than nothing it has special value in that it can be used for washing out the eye after chemical splashes Unfortunately most factory first aid boxes will not have running water adjacent and our teaching is based on the assumption that running water is not available

4 Beneath the table there should be a pedal-controlled bucket for the disposal of used dressings It is part of the first aider's job to see that this is emptied regularly and kept clean

5 The light should be good

Sometimes the first aid box will be located in the main body of the factory or shop (*Fig* 14) sometimes in a special room set aside partially or wholly for the purpose If in the shop itself it is particularly important to try to preserve a small clear working space below this can usually be done if the box is in the stores but it is less easy if it is over a work bench

Stocking Up

In an organised industrial health service regular inspection and stocking up of first aid boxes is part of the duty of the trained nursing staff The frequency with which this has to be done will depend on the number of casualties to be treated In the Harlow Industrial Health Service factories are divided into those to be visited weekly monthly or three monthly depending on size and casualty rates These visits for inspection and stocking help to build a useful link between first aiders and the trained industrial nurses If stocks run low between visits first aiders are responsible for letting this be known

Complaints about the possibility of pilfering from first aid boxes are usually much louder than the facts justify First aid boxes should *never* be kept locked, first aid which is delayed while a key is searched for is a travesty Normally only a trained first aider should have recourse to the box It follows that there should always be at least one trained first aider on every shift Moreover one particular first aider must be responsible for the box and its stocks

His name and that of his deputy should be on the outside of it Where a first aid box is supplementary to a factory first aid room or medical department it is may be used only when the room or department is shut In such a case it is helpful if instructions to patients needing treatment are also displayed on the box

Chapter 3

Principles of Wound Treatment

We define a wound as any break in the skin with or without injury to the deeper tissues Thus the term wound covers every type of skin break from the trivial scratch to the severe crush injury

The skin is the body tissue most liable to injury and it is estimated that in Britain every day there are half a million skin injuries of sufficient size to need at least a first aid dressing Of these one in every ten needs attention at a factory surgery or industrial health centre

It follows that wounds are by far the commonest reason for first aid Experienced first aid workers will have treated many different types of wound Even beginners must have seen cuts of various kinds It is a useful class exercise for each member to describe a wound he has seen and how it was caused

Here are some typical industrial wounds

1 A straight cut from a chisel or sheet metal. This is an *incised* wound

2 A tearing wound with ragged edges where flesh is caught in a machine This is a *lacerated wound*

3 A crushing wound with the flesh around bruised and injured from a hammer blow or injury from a spanner or rollers This is a *contused* wound

4 A deep stab from stepping on a nail This is a *puncture* wound Incidentally a severe puncture wound may bleed very little or even not at all.

5 A scraping wound or graze where the skin surface is torn by a file or sand paper for example This is an *abrasion*

Major and Minor Wounds

The most important division for all first aiders to learn especially industrial first aiders is

1 Minor or simple wounds – the ordinary everyday small skin cuts of home or work place which can properly be treated by the first aider

2 Major wounds – everything more severe than the minor wound In these the first aider gives true first aid treatment only pending the arrival of or referral to a trained nurse or a doctor

This division of wounds emphasises the most important single decision which the industrial first aider has to make Can I properly treat this wound myself? Or ought I to apply first aid only and send for or refer to a trained nurse or doctor? "

The first aider must never feel reluctant about passing on the patient to more

skilled hands – just as the nurse passes the patient on to the general practitioner and the general practitioner passes on to the specialist The good first aider thinks only of the patient s welfare so is always ready to seek further help The bad first aider tries to be an amateur doctor to the danger of the patient and at some legal risk to his employer and himself

In the case of obviously severe wounds there is no difficulty in making a decision nor is there any with the half inch long shallow graze on the hand Between these two there are many types of wound where the first aider in industry will have to make a judgment

There are three things to be considered

1 *The position of the wound*

Any wound around the eye or involving the skin of the face is serious Any wound other than a small shallow cut of the finger hand or wrist is to be treated as serious even a small scar on a finger may reduce the skill and affect the liveli hood of a manual worker Any wound of the abdomen is serious

2 *The type of wound*

Any wound with ragged edges or with the flesh around it bruised is serious because the damaged tissue is more liable to infection Any deep wound or stab or puncture wound is serious because infection carried in by the wounding object is more likely to gain a foothold and because there may be unseen damage to deeper tissues Any gaping wound the edges of which do not easily come together is serious because the exposed raw area is more likely to get infected and the scar will be wide and disabling

3 *Complications of the wound*

Any wound from which the blood pumps out in jerks is serious because this means an artery has been cut Any wound from which the blood gushes out in a steady stream is serious because this means a vein has been cut Any wound more than an eighth-of an inch deep may involve damage to muscles tendons nerves or other structures This risk is greatest in the wrist hand and fingers The first aider cannot tell if these structures have been injured Therefore any cut more than an eighth of an inch deep especially in the wrist hand or fingers is serious

Bleeding

Bleeding (haemorrhage) is part of the natural response to injury So it need not cause alarm in the first aider or the patient Bleeding is nature s means of wound cleansing because it washes dirt out from the bottom of the wound

Too much bleeding is a danger simply because beyond a certain point the body cannot swiftly make up for blood loss But bleeding from *most* wounds will stop spontaneously without any treatment at all (*Fig* 15 a and b)

The body has two very effective methods of stopping bleeding

1 The clotting of blood as a result of its coming in contact with cut and injured tissues

2 The pulling back and shrinking of the cut ends of blood vessels so that the holes from which the blood is coming get smaller and may close entirely

Bleeding from *minor* wounds will occur during the cleansing of the wound it helps to make the cleansing more thorough As soon as the wound is covered and

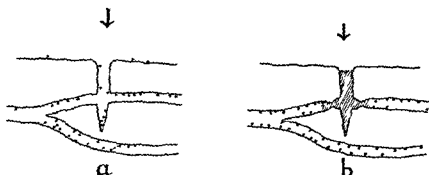


FIG 15 *The body's way of stopping bleeding (a) At the moment of wounding blood pours out from the cut blood vessels (b) Within a few minutes the blood has clotted to form a tough jelly and the cut ends of the blood vessels have pulled back and shrunk (Fluid blood is shown as dots clotted blood as cross hatching the arrows show the site of the wound)*

the edges drawn together by the dressing clotting of the blood will take place and the bleeding will stop

Bleeding from *major* wounds will also usually stop on its own when a dressing is applied The first aider can do three things to help the body to stop such bleeding

1 *Rest*

Make the patient lie down quietly and keep the wounded part still This lowers the blood pressure and slows the pulse so that the volume of blood flowing through the injured part is lessened

2 *Raising the injured part*

If the injured part is raised above the level of the rest of the body the amount of blood reaching it will be less for simple hydraulic reasons A wounded arm or leg may be raised on pillows but the stomach or chest cannot be effectively raised

3 *Pressure on the place which is bleeding*

This is the most important and most effective way of controlling bleeding It can be stated that if enough pressure is applied haemorrhage can always be controlled

Applying Pressure

1 Place a clean pad over the wound and bandage it firmly in place If blood quickly comes through the first pad *put another pad on top* and bandage this firmly in place If blood comes through the second pad apply a third pad If blood still comes through press firmly with the hands on the third pad and hold in position until a doctor can take over (*Fig* 16a and b overleaf)

2 As already stressed the official Factories Act sterilised individual dressing is ideal for the control of bleeding *since it has a built in pad attached to a bandage* and the whole dressing is sterilised

3 If an official first aid dressing is not available a rolled up bandage may be used as a pad or a clean folded handkerchief If necessary a clean handkerchief may also be used as a bandage

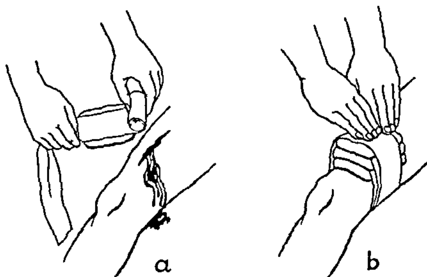


FIG 16 (a) *Applying a pad and bandage (the official sterilised individual dressing) to stop haemorrhage (b) If after three pads have been applied the blood still comes through the last pad must be pressed upon firmly until medical or nursing help arrives*

Every first aider especially in industry must have personally practised applying a pad and bandage to control bleeding so that he can do it effectively when faced with his first major wound

Pressure Points

Most first aiders are taught that there are certain points between the heart and the site of bleeding where by pressing hard against an underlying bone the arterial flow can be stopped Most doctors have never made use of these pressure points

Here is a summary with which we fully agree of what is said in the Canadian St John First Aid book about pressure points

Extensive experience with battle casualties and civilian accidents has failed to reveal an instance of life saved by pressure point technique

With the very rare massive haemorrhage which might in theory be stopped by pressure point control it is almost inconceivable that a first aider will reach the scene of the accident and find the correct pressure point in the few seconds before death results Even with such a haemorrhage and certainly with any bleeding less catastrophic effective control is much more likely to be accomplished by simple direct pressure on the wound

Indeed valuable time may be wasted trying to locate the elusive pressure point while the patient s life blood continues to drain away unchecked by simple pressure on the wound

In fact it is extraordinarily difficult especially in fat people to compress the femoral artery in the groin and almost impossible to deal with the subclavian artery in the neck

We recommend the abandonment of pressure point teaching in industrial first aid We do not expect any industrial first aider to risk the patient s life by hunting

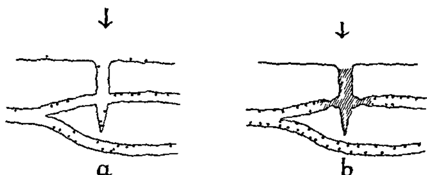


FIG 15 *The body's way of stopping bleeding (a) At the moment of wounding blood pours out from the cut blood vessels (b) Within a few minutes the blood has clotted to form a tough jelly and the cut ends of the blood vessels have pulled back and shrunk (Fluid blood is shown as dots clotted blood as cross hatching the arrows show the site of the wound)*

the edges drawn together by the dressing clotting of the blood will take place and the bleeding will stop

Bleeding from *major* wounds will also usually stop on its own when a dressing is applied The first aider can do three things to help the body to stop such bleeding

1 *Rest*

Make the patient lie down quietly and keep the wounded part still This lowers the blood pressure and slows the pulse so that the volume of blood flowing through the injured part is lessened

2 *Raising the injured part*

If the injured part is raised above the level of the rest of the body the amount of blood reaching it will be less for simple hydraulic reasons A wounded arm or leg may be raised on pillows but the stomach or chest cannot be effectively raised

3 *Pressure on the place which is bleeding*

This is the most important and most effective way of controlling bleeding It can be stated that if enough pressure is applied haemorrhage can always be controlled

Applying Pressure

1 Place a clean pad over the wound and bandage it firmly in place If blood quickly comes through the first pad put another pad on top and bandage this firmly in place If blood comes through the second pad apply a third pad If blood still comes through press firmly with the hands on the third pad and hold in position until a doctor can take over (*Fig* 16a and b overleaf)

2 As already stressed the official Factories Act sterilised individual dressing is ideal for the control of bleeding since it has a built in pad attached to a bandage and the whole dressing is sterilised

3 If an official first aid dressing is not available a rolled up bandage may be used as a pad or a clean folded handkerchief If necessary a clean handkerchief may also be used as a bandage

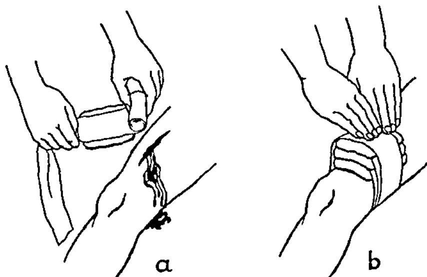


FIG 16 (a) *Applying a pad and bandage (the official sterilised individual dressing) to stop haemorrhage (b) If after three pads have been applied the blood still comes through the last pad must be pressed upon firmly until medical or nursing help arrives*

Every first aider especially in industry must have personally practised applying a pad and bandage to control bleeding so that he can do it effectively when faced with his first major wound

Pressure Points

Most first aiders are taught that there are certain points between the heart and the site of bleeding where by pressing hard against an underlying bone the arterial flow can be stopped Most doctors have never made use of these pressure points

Here is a summary with which we fully agree of what is said in the Canadian St John First Aid book about pressure points

Extensive experience with battle casualties and civilian accidents has failed to reveal an instance of life saved by pressure point technique

With the very rare massive haemorrhage which might in theory be stopped by pressure point control it is almost inconceivable that a first aider will reach the scene of the accident and find the correct pressure point in the few seconds before death results Even with such a haemorrhage and certainly with any bleeding less catastrophic effective control is much more likely to be accomplished by simple direct pressure on the wound

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for a pressure point instead of applying direct pressure to the place which is actually bleeding

The Tourniquet

Factory first aid boxes must contain a rubber or pressure bandage for use as a tourniquet It should never be used as it is not a first aid measure It is often ineffective and frequently harmful If properly applied it can cause death of a limb *If improperly applied it can increase bleeding by obstructing the veins but* not the arteries Finally it is never necessary as bleeding can always be stopped by the safe simple method of direct pressure

Deep Cut of Wrist or Arm

Such a cut, particularly at the wrist may produce spirting or pumping haemorrhage if one of the larger arteries is cut If this happens treatment follows exactly the lines set out above

1 Make the patient lie down

2 Hold up the arm so as to raise the injured part above the level of the rest of the body

3 Place a clean pad over the wound and bind it very firmly in place Apply another pad and bandage

4 Send for a trained nurse or doctor or transport the patient to the industrial health centre or hospital If possible the patient should be lying down with the arm and wrist raised on a pillow or folded blanket

Importance of Blood Loss

About one-eleventh of the weight of the body is blood There are about 12 pints of blood in the average adult A little blood can make a big mess to demonstrate *this upset a 2 ounce bottle of red ink and see how much bandage and cotton wool* it will colour A normal adult can lose a pint of blood without ill effect many people give this much blood twice a year to the blood transfusion service Most bleeding is not serious and the first aider need never be frightened by it

On the other hand the loss of a large amount of blood produces a very dangerous state As the bleeding goes on it leads to pallor and weakness then unconsciousness and finally death If life is to be saved after the bleeding has been controlled by firm pressure it is vital at the earliest possible moment to replace the blood which has been lost by means of a blood transfusion

A patient who is believed to have lost a large amount of blood must be moved as swiftly as possible to a hospital where a blood transfusion can be started at once

If transfusion can be started within half an hour life will probably be saved delay of over an hour may prove fatal By making arrangements quickly and calmly the first aider is acting in a life saving role

It will help the doctor at the hospital to estimate the amount of blood which has been lost and hence the amount of blood the patient needs if the blood lost can be mopped or scooped up and the blood and stained dressings cotton wool and clothing put in an enamel basin and sent with the patient to hospital But do not waste time on this if it means delay in getting him there

Cover the patient with two blankets or a coat Apart from lifting out of danger or on to a stretcher keep movement to a minimum

Infection

Infection means the entry of harmful germs into a wound so that they start to grow and multiply

Every year about 20 000 industrial workers receive compensation for infected injuries and each loses on an average three weeks of working time This takes no account of minor degrees of infection involving less than three days off work Clearly the prevention of infection in first aid is just as important as the control of bleeding

When germs were first discovered doctors sought chemical substances which would kill them Such chemical substances are called antiseptics Unfortunately most antiseptics not only kill germs they also damage human tissues In addition they may sometimes produce skin rashes For these reasons their use as a means of trying to kill germs in wounds has been largely given up Old ideas die hard until recently first aid boxes still had to include iodine or gentian violet * and many first aiders still like to use acriflavine or one of the many proprietary antiseptics

To paraphrase the Canadian St John manual *Iodine and other tissue damaging antiseptics have no place in first aid and should not under any circumstances be poured into or on a wound*

Germs get carried into a wound by whatever causes the wound – a nail hammer chisel cutting tool drill or knife Even if the injuring instrument is germ free for example a very hot tool germs may be picked up as it passes through the patient s boot or shoe clothing and skin These germs are got rid of by the process of cleaning the wound and as already mentioned by bleeding

After the original injury germs may still get in by droplet spray infection from people talking sneezing or coughing near the wound or from the skin of careless first aiders doctors or nurses These germs are kept out by surgically clean technique and by closing and covering the wound

Cleaning the Wound

A *major* wound needs thorough cleaning by a trained nurse or doctor An extensive major wound may need opening and cleaning thoroughly by a surgeon with the patient or at least the wounded part anaesthetised Delay in getting a major wound properly cleaned increases the likelihood of the germs gaining a foothold in the tissues The first aider s job is to cover the major wound with a sterile pad as quickly as possible

A *minor* wound is best cleaned by washing thoroughly with clean water under a running tap (*Fig* 17) If there is any visible dirt present around the minor wound it may be washed away with soap and water Better even than soap is the officially recognised detergent cetrimide (Cetavlon) this has an antiseptic action as well but does not injure the tissues

Iod e nd ge t n l t d ppe under the F cto F t d B es Orde (1959) wh h c me nto force n J nuary 1960 Although not recomme ded for first a ders u d any ci um tanc th y s ll h a re l lue n c i n spec l types f med c l t tm t

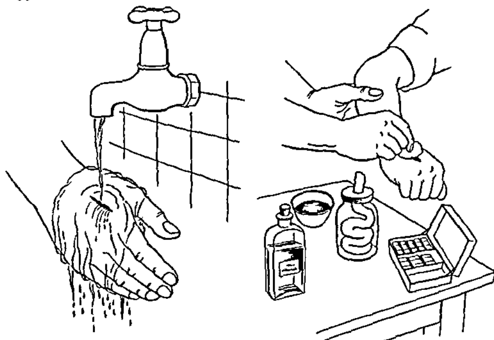


FIG 17 (left) *A minor wound is best cleaned by washing thoroughly with clean water under a running tap*

FIG 18 (right) *In most small and medium sized factories running water is not available at first aid points The standard method recommended of cleaning a minor wound is to use cotton wool swabs dipped in cetrimide* (1 *per cent*) *A full description of the technique is given in the text*

In many factories running water is not available at the first aid point Here cleaning of the wound and surrounding skin is best done with cotton wool dipped in cetrimide (*Fig* 18) The cetrimide is poured into a small galleypot A piece of cotton wool about two inches long is pulled from a cotton wool container and dipped into the cetrimide The wound is thoroughly cleaned The process is repeated twice with fresh pieces of cotton wool each time The skin around the wound is then cleaned in a similar way care being taken to work outwards from the wound and to avoid touching the wound with the cotton wool used for skin cleaning Finally first the wound then the surrounding skin are thoroughly dried with fresh dry pieces of cotton wool so as to remove all the cetrimide (or soap and water) This is necessary for two reasons first cetrimide or soap left in contact with raw tissue may lead to sensitivity with the possibility of a skin rash later on second unless the skin is dried strapping will not stick to it After use each piece of cotton wool should be thrown into an appropriate receptacle

Closing and Covering the Wound

Any wound which is left gaping is more liable to become infected Even if not infected a gaping wound will heal much more slowly and will leave behind a wide and perhaps disabling scar This is why the first aider must regard any gaping

wound as a major wound to be covered with a clean or sterile dressing and passed on at once to a trained nurse or doctor Many gaping wounds will require stitching (suturing) to bring the edges together for which most doctors nowadays use a local anaesthetic

In covering a minor wound the first aider must take all reasonable steps to keep germs away from the cleaned wound and the dressing Ideally the first aider should wash his hands thoroughly before he starts cleaning or dressing but in a factory this may be impossible He must be careful not to cough sneeze or talk over the wound Even more important is to keep his own skin germs away from the wound or anything which is going to touch the wound surface This means no touching of the wound with the fingers and no touching of the surface of the dressing which will be placed next to the wound Every first aider must practise this simplified no touch method of dressing wounds until he does it quite automatically

The wound which has been properly cleaned closed and covered will heal in the shortest possible time almost without pain and with the smallest possible scar In surgery this is spoken of as healing by first intention It is the object of good first aid good industrial medicine and good casualty surgery to enable every wound to heal by first intention

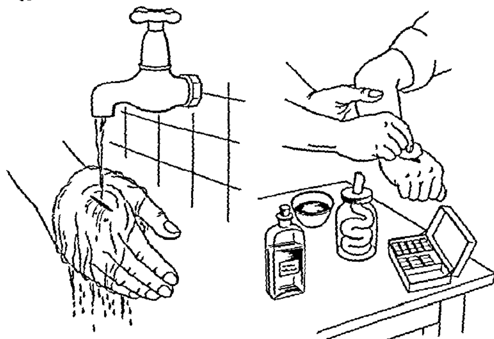


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frequently changed is to be preferred to an occlusive dressing since the skin beneath stays in better condition and healing is therefore quicker But workers in food factories should have all bandages and dressings covered with an occlusive finger stall or cot to prevent any possible contamination of the product

Re-dressing Minor Wounds

A minor wound should be re-dressed as seldom as possible If there is no pain it is only necessary to change the outer dressing when it is soiled the dressing imme diately over the wound should be left in position if possible for 48 hours Exactly the same care must be used in changing a dressing as when the dressing is first applied.

If the patient complains of pain or discomfort in a minor wound on the day after injury or thereafter the first aider *must* refer the patient at once to a trained nurse or doctor as infection is likely to have occurred

Treating Major Wounds

Again treating the major wound is a matter of applying procedures already described Here the first aider gives true first aid pending the arrival of or referral to a trained nurse or doctor

The first aider will make no attempt to clean a major wound His job is

1 To prevent any further risk of infection by covering the raw surface of the wound with a sterile or clean dressing as quickly as possible

2 To control haemorrhage by making the patient lie down quietly raising the injured part and binding the pad or dressing over the wound firmly in place

The ideal pad and bandage is the official individual sterilised first aid dressing If the bleeding rapidly soaks through one or more pads should be applied and firmly bound in place over the first one

Once a major wound has been covered the sooner expert help is obtained the better for the patient

Foreign Bodies in Wounds

A large foreign body such as a piece of metal or glass if sticking out of the wound should be removed gently provided this can be done without putting the fingers into the wound If the foreign body does not come out easily it should be left alone Small foreign bodies are best not touched but a note that they have been seen should be sent on with the patient

In a severe injury there may on rare occasions be a piece of bone projecting through the wound or the skin this should be left alone and not touched

If a large foreign body cannot be removed or if there is projecting bone rolled bandages with the paper removed may be placed on each side of the projecting object the wound object and rolled bandages are then covered with a large individual first aid dressing this should be bandaged in place firmly but not tightly (*Fig* 19) Most first aiders are taught to build up a ring or box of dressing around wounds of this type so that the covering dressing does not press on the wound But rolled bandages are just as good and to put them in place takes very little time Any elaborate building up while the wound is left uncovered increases the

Chapter 4

Details of Wound Treatment

The principles governing the treatment of wounds must now be extended to cover wounds of special types and in special places But first the standard treatment of minor and major wounds must be recapitulated so that the necessary variations to meet special conditions may be seen in proper relation to standard procedure

Treating Minor Wounds

In treating a minor wound the prevention of infection is more important than the control of bleeding With proper treatment to prevent infection bleeding will stop on its own

The stages of treatment are

1 Clean the wound with cetrimide in a galleypot and cotton wool or wash it under running water if available

2 Dry the wound and surrounding carefully with cotton wool

3 Cover the wound with an appropriate sized piece of prepared strapping with a central dressing This must be so applied as to draw the edges of the wound together Remember not to cough sneeze or talk over the wound Do not touch anything which will be in direct contact with it

If the wound is on a part which is continually in movement or is liable to get soiled with dirt or oil the strapping should be covered with a neatly applied roller bandage Even a short end of bandage is a danger to a machine operator So after the bandage has been split and tied and the ends cut short these ends should be covered with one or two turns of strapping Neatness is essential and the first aider should practise this under supervision

At the beginning and end of each working day or better still each four hour working period a fresh outer bandage should be applied It is dangerous to leave soiled and oil stained bandages over a raw wound for any length of time for example overnight this is one cause of skin sensitivity and dermatitis

Tube gauze dressings though excellent in skilled hands are not recommended for the first aid worker

A bandage gives partial protection only against oil The alternative is a completely occlusive cover of rubber or something similar over the dressing A rubber or plastic finger-cot may be used or specially constructed finger-cot made from crimped Stericrepe No occlusive dressing should be allowed to stay on for more than a few hours or the skin beneath it will become boggy On balance a protective bandage

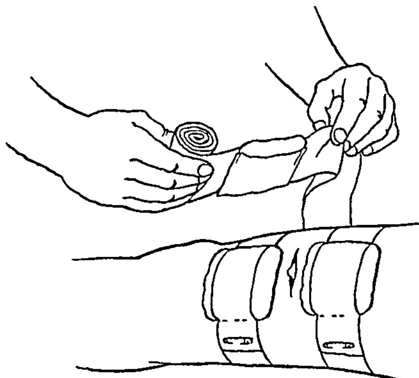


FIG 20 *Protecting and bandaging a larger wound with a projecting foreign body The pads of two individual sterilised dressings are made use of to relieve pressure on the projecting foreign body*

germs may be carried deep into the tissues where they cannot be reached by ordinary cleaning There is no point in cleaning the wound and the skin around unless the skin is dirty as the site of the injury cannot be reached All that is needed is to apply a small dressing the patient should then be referred as soon as possible to a trained nurse or doctor

Animal or human bite The mouth is full of germs so bites are usually badly infected Moreover they are often also lacerated or puncture wounds Every bite however small should be treated as a major wound as set out above

Wound of the chest A crush wound of the chest may damage the lungs The patient may cough up blood and find it hard to breathe He may breathe easier if propped up in the semi sitting position but what is most important is to find the position of greatest comfort for the patient

A puncture wound of the chest is a rare occurrence Sometimes the puncture may actually reach into the chest cavity With such a wound air is sucked in at each breath It should be covered at once with a large dressing which must be fixed on firmly to keep out the air (*Fig* 21)

Any patient with a chest wound should be moved to hospital as quickly as possible

Wound of the abdomen Because of the risk that an abdominal wound may have

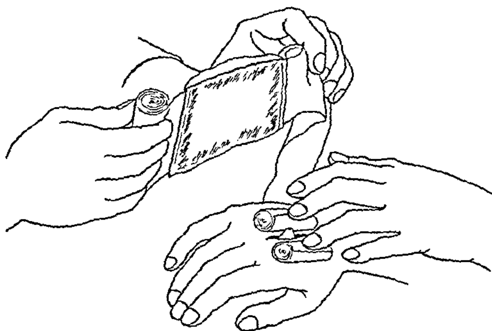


FIG 19 *Protecting and bandaging a wound with a projecting foreign body Note the two rolled bandages held in place by the patient or an assistant and so arranged as to prevent the dressing pad pressing hard on the foreign body when the bandage is fixed*

chances of infection An alternative method of bandaging over a foreign body *without pressing on it is to use individual sterilised dressings on either side of the wound as shown in Fig 20* this method is specially useful where the wound is large

Special Wounds

Small crush graze or laceration Any crush graze or laceration other than a very small one is to be treated as a major wound and referred to a trained nurse or doctor

First aiders often ask to be allowed to use acriflavine or some other oily dressing for small crushes grazes and lacerations since it prevents sticking when the dressing is changed *But acriflavine has the disadvantages of iodine and other chemical* antiseptics and oily preparations delay healing In any event frequent changing of the dressing should not be needed unless the injury has become infected

The proper treatment for a really small crush graze or laceration is thorough cleaning with cetrimide as described above followed by a dry dressing protected by a bandage to keep it clean Anything larger should be covered with a sterilised first aid dressing and referred to a trained nurse or doctor

Puncture wound This may be caused by a nail through the boot a drill which slips a glass splinter a wire brush, or any other thin pointed object.

All such wounds are *to be treated as serious* because germs particularly tetanus

The treatment follows exactly the general principles for all serious bleeding

1 Rest The patient should lie down

2 Raise the wounded part The foot should be raised and when the wound has been dressed the leg should be supported with cushions or pillows

3 Direct pressure on the bleeding part A sterile pad should be applied and firmly bandaged in place This should stop the bleeding almost at once One or more pads should be bound on top of the first if necessary

It is very dangerous to apply a tourniquet to a leg with a bleeding varicose vein as it may increase the haemorrhage

Stings, Insect bites and Blisters

Bee and wasp stings may occur in factories and canteens as elsewhere They are a special risk in jam factories

The *bee* leaves both its sting and poison bag behind If the sting is grasped with a pair of forceps in order to pull it out the contents of the poison bag may be pumped into the patient The sting is best lifted or scraped off the skin with one blade of a pair of forceps or with a pin The patient should then suck the wound and spit out

The only other local treatments of any value are the application of a proprietary antihistamine ointment (e g Anthisan) sold in a collapsible metal tube failing this a cold compress or an ice-pack may help These are described in the next section The statement that the bee s venom* is acid is quite untrue and treatment with mild alkali based on this assumption is useless If the sting is in the mouth skilled nursing or medical help is required at once While help is coming the patient should be given a piece of ice to suck

The *wasp* leaves no sting behind so the patient should suck the wound and spit out forthwith Further local treatment is exactly the same as for a bee sting – that is to say antihistamine ointment a cold compress or an ice pack Like bee venom wasp venom is a complicated mixture of organic compounds The old story that it is alkaline is without foundation so vinegar and lemon juice are valueless as methods of treatment As with a bee sting if the wasp sting is in the mouth skilled help should be sought at once and ice given to suck

With any sting the patient may start to swell up either around the injury or generally or show signs of shock If this happens skilled nursing or medical help is needed immediately

Spider and *snake* bites may occur in industrial workers Those at risk are dockers and banana ripening store operatives The creatures are imported in the banana bunches usually from Brazil They are not found in West Indian bananas though a 3 inch non biting spider is sometimes seen The Brazilian banana spider is huge with a 2 inch body and a leg span of 6 or more inches It is not a true tarantula Its bite will draw blood but is usually not serious nevertheless anyone bitten should be sent to a hospital or doctor

The snake most often seen is the Brazilian tree snake but even this is very rare

* Bee venom is a complicated mixture of organic compounds One is apitoxin a low molecular weight protein Another is phospholipase which damages the body cells so that they liberate a substance histamine which causes the local irritation and swelling Hence the value of an antihistamine ointment

punctured the stomach or bowels it is very important that the patient should be given nothing to eat or drink He should be moved to hospital without delay

Nose Bleeding

Epistaxis or nose bleeding may follow a blow on the nose nose picking or a bad cold such nose bleeding will usually stop quickly Or it may follow a severe head injury which means usually that the skull is fractured Often nose bleeding is spontaneous and has no obvious external cause this type is more likely to last for some time and perhaps be serious It is not part of first aid to attempt to diagnose the cause of spontaneous nose bleeding If there is other serious injury its treatment must take precedence over nose bleeding

First aid treatment in the absence of major injury is as follows

1 Sit the patient up with the head thrown back

2 Make him breathe through his mouth and hold his nostrils closed for five minutes Thereafter he must be warned not to sniff

3 Apply cold water to the bridge of the nose by means of a handkerchief or cotton wool soaked in it

If the bleeding continues or recurs the patient should be seen by a doctor The first aider should never attempt to plug the nose

Ruptured Varicose Vein

A varicose vein is an enlarged leg vein just under the skin in which the blood is circulating inefficiently Varicose veins are common in both sexes in those over 40

A small leg wound which penetrates a varicose vein will bleed profusely Here first aid can be life saving

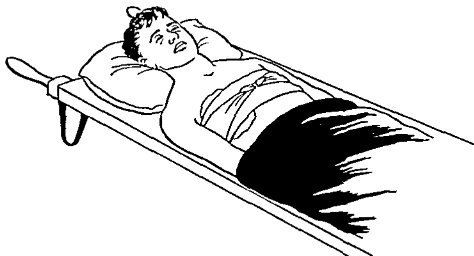


FIG 21 *A large pad and bandage applied over a puncture wound of the chest to help to keep out the air which tends to be sucked in at each breath A folded triangular bandage tied round the chest is used to keep the pad firmly in place*

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Bee venom s a compl cated m t e of o g nic ompound One p tox n a l w molecul r we ght p ot n Anoth is pho phol p se th s damages the body cells so th t they l berate a sub t nce h t m ne wh ch causes the l l i rit t on and well g Hence the l e of an ant histam ne o tm t

The treatment is as for other snake bites Wash the bite thoroughly to remove any venom which the snake may have spat out into the skin Suck the wound hard and spit out Tie a bandage (or the bandage part of a sterilised individual dressing) tightly round the limb between the bite and the body *This will not stop the blood flow but will cut down the flow of lymph (body tissue fluid) back to the body it is* in the lymph that the venom mainly travels The bandage should be loosened for half a minute every quarter of an hour *Send for skilled help at once* or send the patient immediately to hospital The snake should be killed and sent in a box with the patient for identification

Patients sometimes arrive at work with painful swellings due to *mosquito* or other bites These are not first aid problems and need nursing or medical examination and care

Blisters other than blood blisters are not emergencies though they may be very incapacitating *The first aider should not puncture blisters as the chances of carrying in infection are high* The blister and surrounding skin should be cleaned gently with cetrimide and covered with a dry dressing under this the blister may burst spontaneously and safely If a blister is painful or obviously infected it should be seen by a trained nurse or doctor

Contusions

A contusion or bruise is bleeding under the skin with the skin surface unbroken First aiders will be able to think of many examples the bruised bottom following a slip a fall downstairs or a skating accident the black eye the thick ear the egg like bruise on the scalp the bruise on the front of the shin the bruise under the nail following a pinch from a door or a weight dropped on a toe the bruise over the ribs

Faced with a bruise the main duty of the first aider is *to make sure that no bones are broken and there is no other serious injury If slight movement causes severe pain serious injury must be assumed*

Because the germs cannot get through the intact skin no dressing is needed over a bruise Pain may be relieved by a cold compress re-cooled as often as necessary or by an ice pack A cold compress is made by dipping a clean folded handkerchief or a folded triangular bandage in water this is placed on the bruise without wringing out it may then be covered with cotton wool and a firm bandage An ice pack may be made by wrapping ice-cubes in a thick towel and crushing them with a mallet.

No attempt should ever be made by a first aider to empty a bruise by puncturing it The idea that it is necessary to "bring out a bruise" is an old wives tale

Chapter 5

General Effects of Serious Injury

Every severely injured patient soon becomes very ill This illness is known as shock Without proper treatment shock is often fatal With proper treatment applied quickly enough the patient almost always recovers Proper treatment of shock can be summed up in the words blood transfusion Every half hour that blood transfusion is delayed decreases the patient s chances of recovery

The first aider s duty is plain It is to speed the removal of the severely injured patient to a properly equipped hospital doing only what is necessary meanwhile to prevent the shock getting worse If the severely injured patient is in hospital within half an hour the first aider will have played a major part in saving life

Mythology of Shock

Since shock following wounds was first recognised in the 1914 18 war medical ideas about its causes and treatment have repeatedly changed These changes have inevitably been reflected in first aid teaching The consequence has been muddle and confusion Now the facts are becoming clear and from the first aider s point of view they can be stated quite simply But first the muddle must be cleared away

Some first aid teachers actually describe six kinds of shock primary secondary haemorrhagic traumatic toxic and nervous

1 Primary shock is fainting and the condition popularly spoken of as shock following an unpleasant experience or a nasty shake-up We shall describe it later

2 Secondary shock or established shock is true wound shock with which we are concerned here

3 Haemorrhagic shock is another name for true wound shock emphasising the importance of bleeding in its cause

4 Traumatic shock is yet another name for true wound shock The word traumatic is the adjective of " trauma which simply means *injury*

5 Toxic shock is a rare condition coming on four or more hours after severe injury and therefore almost never seen by the industrial first aider

6 Nerve shock or nervous shock is a meaningless term since there are nervous factors in every case of shock These nervous factors range from purely *psycholog cal anxiety* to the excruciating pain following a blow in the solar plexus or on the testicle

From this point on we shall use the word shock only for true wound shock *that is for* Nos 2 3 and 4 in the above list

The muddle over the definition of shock is matched by the confusion and controversy over treatment Here we shall follow what we hope is a reasonable middle course based largely on the valuable researches carried out at the *Birmingham*

The treatment is as for other snake bites Wash the bite thoroughly to remove any venom which the snake may have spat out into the skin Suck the wound hard and spit out Tie a bandage (or the bandage part of a sterilised individual dressing) tightly round the limb between the bite and the body This will not stop the blood flow but will cut down the flow of lymph (body tissue fluid) back to the body it is in the lymph that the venom mainly travels The bandage should be loosened for half a minute every quarter of an hour Send for skilled help at once or send the patient immediately to hospital The snake should be killed and sent in a box with the patient for identification

Patients sometimes arrive at work with painful swellings due to *mosquito* or other bites These are not first aid problems and need nursing or medical examination and care

Blisters other than blood blisters are not emergencies though they may be very incapacitating. The first aider should not puncture blisters as the chances of carrying in infection are high The blister and surrounding skin should be cleaned gently with cetrimide and covered with a dry dressing under this the blister may burst spontaneously and safely If a blister is painful or obviously infected it should be seen by a trained nurse or doctor

Contusions

A contusion or bruise is bleeding under the skin with the skin surface unbroken First aiders will be able to think of many examples the bruised bottom following a slip a fall downstairs or a skating accident the black eye the thick ear the egg like bruise on the scalp the bruise on the front of the shin the bruise under the nail following a pinch from a door or a weight dropped on a toe the bruise over the ribs

Faced with a bruise the main duty of the first aider is to make sure that no bones are broken and there is no other serious injury If slight movement causes severe pain serious injury must be assumed

Because the germs cannot get through the intact skin no dressing is needed over a bruise Pain may be relieved by a cold compress re-cooled as often as necessary or by an ice pack. A cold compress is made by dipping a clean folded handkerchief or a folded triangular bandage in water this is placed on the bruise without wringing out it may then be covered with cotton wool and a firm bandage An ice pack may be made by wrapping ice-cubes in a thick towel and crushing them with a mallet.

No attempt should ever be made by a first aider to empty a bruise by puncturing it. The idea that it is necessary to " bring out a bruise is an old wives tale

Bleeding as a Cause of Shock

Actual blood loss is now regarded as by far the most important factor in producing shock after severe injury

External blood loss can be seen and as already mentioned the blood should be mopped up and collected and sent with the patient to hospital to help the surgeon to judge how much has been lost

Internal blood loss usually takes the form of bleeding from an ulcer in the stomach or bowel the blood may be vomited up or passed in a motion Although this is not produced by injury the condition of shock does not differ in any way at all from that produced by external bleeding

Blood loss into *the tissues* themselves can be equally important as a cause of shock If a large bone is broken there will usually be a great deal of bleeding into the tissues around the broken ends even though nothing shows from outside This internal bruising can be detected by measuring the amount of swelling of a limb A broken shin bone (or tibia) will cause an internal bleeding of about a pint of blood not really enough on its own to produce shock But a broken thigh bone (or femur) will cause two and a half to three pints of hidden internal bleeding with quite considerable shock as a result

Capillary Leakage

When tissues are injured they produce certain chemical substances which pass into the blood These substances affect the capillaries in the immediate vicinity of the injury and also generally throughout the body Their distant effect can be shown in the following way If the veins from the injured part are temporarily blocked the degree of shock is reduced and when the block is released the shock gets worse

The capillaries affected are first caused to dilate This means that some part of the blood of the body stagnates here out of effective use Next the walls of the capillaries begin to leak so that the fluid part of the blood can seep away (*Fig* 22) The result is a further reduction in the amount of available blood

This seeping away of the fluid part of the blood is specially important in extensive burns The capillaries in the burnt area itself become very leaky indeed and huge quantities of fluid can be lost from the burnt surface One result of this is that the blood which remains becomes thicker and stickier In severe burns local fluid loss is of paramount importance in producing shock

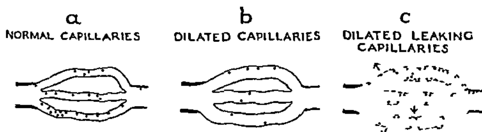


FIG 22 (a) *Normal capillaries The dots in the blood are the red blood-cells* (b) *In shock the affected capillaries first dilate so that blood stagnates in them thus reducing the amount of blood in circulation* (c) *They then start to leak so that the fluid part of the blood can seep away The red blood cells are too large to escape through the leaks as a result the loss of fluid increases their concentration so that the blood becomes thicker and stickier*

Accident Hospital In so doing we hope not to upset too deeply either the con servatives or radicals

The Shocked Patient

The picture of the patient with shock looks like this

1 The facial expression is anxious and *worried looking or staring in a vacant way*

2 The skin colour is pale – white ashen grey or slightly blue

3 The skin feels cold yet in spite of this it may be soaked in sweat

4 The patient is sometimes restless fidgety and even talkative but may be dull and sometimes even unconscious

5 The breathing is rapid and shallow sometimes sighing

6 The pulse is usually rapid and feeble though occasionally normal

7 The patient usually complains little of pain but may complain greatly of thirst

8 There may be external signs of the cause of shock such as injury or bloody vomit

The first aider cannot measure the blood pressure If he could he would usually find it low or even very low Similarly he would find the body temperature to be *subnormal though he must not waste time trying to take it*

We can sum up the picture of the shocked patient thus anxious pale cold sweating restless shallow breathing rapid pulse usually little pain much thirst *But remember that a shocked patient does not always show all of* these things at the same time In medicine there are exceptions to even the best word pictures Thus a patient with shock due to a heart attack or a bad fracture may be in great pain

What Happens in Shock

Shock is due to *loss of body fluid* This happens in four different ways

1 Bleeding This may be (*a*) external from the outer surface of the body (*b*) internal from the inner surfaces of the body into the stomach or gut for example from a bleeding stomach ulcer or (*c*) into the soft tissues of the body say around the broken ends of a bone

2 *Seeping away of plasma from the capillaries Plasma is the fluid part of the* blood (that is blood minus red cells) The capillaries are the small tubes which join the arteries to the veins They are the finest blood vessels of all and they have the thinnest walls *Those which start to leak in shock are* (*a*) at the site of injury especially if the injury is a crush or a burn and (*b*) in the rest of the body probably mainly in the muscles and the gut

3 Vomiting

4 Sweating

Each of these ways of losing body fluid must be looked at *in rather more detail* But here we must notice that the fluid in each case comes either directly or indirectly from the blood Moreover the more rapid the blood loss the smaller is the amount needed *to produce shock By contrast* a much greater blood loss can be borne without symptoms of shock provided it occurs sufficiently slowly

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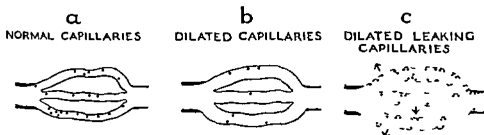


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4 Any tight clothing round the neck chest and waist should be loosened but no clothes should be removed

5 If the weather is cold the patient should be covered with an overcoat or a blanket In warm weather no covering is needed

6 The first aider should be quietly cheerful and confident and have a friendly smile There should be no anxious over activity or forced jollity The answer to the question What first aid treatment is administered by the ear? is words of comfort Remember that the shocked patient has a very acute sense of hearing so do not discuss his condition unless well out of earshot

We now have to consider four rather more controversial aspects of the management of shock position heat fluids and morphia

Position

In theory it is a good thing to raise the legs and lower the head of the shocked patient so as to increase the blood flow to the brain In practice unless the patient is already on a stretcher first aid attempts are likely to do more harm than good If the patient is on a stretcher the foot end may be raised nine inches provided it can be done without risking a spill Otherwise leave well alone

Do not put anything under the shocked patient s head to raise it to do so is simply to reduce the blood flow to the brain The exceptions to this rule are severe injuries to the chest or stomach when pillows or folded blankets under the head and shoulders will give added comfort and safety

If the patient is vomiting or is semi-conscious or unconscious and the injuries permit he should be gently rolled into the semi prone position (*Fig* 23) once again there should be nothing placed under the head to raise it

Heat

For many years warmth has been regarded as the standard treatment of shock and first aiders have been taught to do their duty with hot water bottles and even electric cradles But the reason why the patient feels cold is that the blood vessels in the skin have all closed down as part of a deliberate move to force what little blood is available to the brain and other vital organs Lack of blood in the skin does no harm If external heat is applied so that the skin is made to glow blood

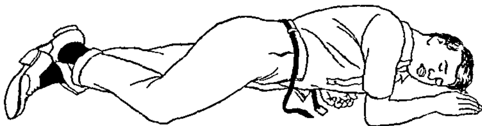


FIG 23 *The semi prone position Note that the body is supported by the upper arm and knee and that the face is turned three quarters towards the ground In this position the tongue falls forward and vomit and saliva can run out of the mouth instead of being sucked into the lungs*

Apart from severe burns capillary leakage is a major factor in producing shock whenever there is substantial damage or destruction of living tissue Such injury is usually due to crushing from falls collapsing buildings pinning under vehicles also limbs crushed in rollers or torn off by machinery

Vomiting and Sweating

Vomiting and sweating both occur as reactions to intense anxiety or severe pain Both tend to make shock a little worse than it otherwise would be but by themselves they seldom involve enough fluid loss to cause serious harm

The sweating on a cold skin which the shocked person so often shows may not be due either to anxiety or to pain The skin has become cold as a means of cutting down heat loss from the body and sweat which would normally evaporate unnoticed remains on the skin as clammy beads of perspiration

Pain

Painful nerve stimuli play a small part only mainly at the start of shock If the nerves from the injured part are blocked the degree of shock is reduced But despite this it is doubtful if pain on its own can produce real shock Thus minor injuries can be excruciatingly painful for example a torn off nail such minor injuries may cause fall of blood pressure and fainting but do not cause real shock

Results of Fluid Loss

Once it is realised that the fundamental cause of shock is lack of blood in circulation the other changes are easily understood Most of them are attempts by the rest of the body to make up for this lack of blood The heart works faster to get what blood there is around the lungs do the same to get all the oxygen they can to the reduced amount of blood the skin blood vessels contract to cut down loss of heat from the body But if internal bleeding or the seeping away of body fluid continues the compensating machinery can do no more The pulse gets weaker the breathing alternates between big sighing and little shallow movements consciousness is clouded and then lost and the patient finally dies because too little blood is reaching the brain

From the above discussion it should be clear that shock is certain to follow all severe crushes tissue tearing injuries burns major bleeding from wounds or from the stomach and breaks of the larger bones The mere occurrence of one of these injuries or conditions is enough to lead to the decision that the patient is suffering from shock

Management of Shock

Because the only life saving treatment of shock is blood transfusion we prefer to speak of the work of the first aider as management rather than treatment Here are the lines he should follow

1 As soon as really serious injury is apparent an ambulance should be called It is then best to telephone the hospital so as to warn the casualty department that a severely injured and shocked patient is on his way

2 The patient should be moved only if absolutely necessary and then only enough to get him out of danger and made comfortable The principle to be followed is utmost gentleness Methods of moving the shocked or unconscious patient will be discussed later

3 Any wounds should be covered and any external bleeding checked

"crush syndrome The same kind of kidney damage may follow severe burns

Crush injuries of this type often occur in air raids and mining and train disasters In industry a limb may be trapped between rollers or part of the body may be crushed by a falling beam or masonry or the collapse of a trench in civil engineering operations

The patient should be released as swiftly as possible If breathing has stopped artificial respiration should be commenced at once The general care of the crush injury follows precisely the same lines as for shock

The current first aid text books still teach that large quantities of fluid should be given by mouth to the patient with a severe crush injury * The theory behind this treatment is that the fluids dilute the poisons and flush out the kidneys There is no real evidence that giving fluids indiscriminately to patients with crush injuries helps them in any way Indeed it may do harm by putting pressure on the kidneys when they are least able to cope At such a time the amount of fluid in the body needs careful scientific control which is possible only in hospital So in crush injuries as with shock from other causes the rule for first aiders must be *no fluids by mouth*

To the best of rules however there have to be occasional exceptions When there is bound to be great delay in getting a shocked patient to hospital either because of distance or because the patient is trapped and when there is no abdominal injury it is inhuman and unnecessary to refuse the shocked patient a drink if it is asked for But water only should be given and in half-cupfuls only at a time A big drink taken suddenly may produce nausea and vomiting

Fainting

At first sight a person who has fainted looks shocked There is extreme pallor with beads of cold sweat on the forehead It may be impossible to feel the pulse Breathing may be shallow and sighing But in a few moments recovery starts and consciousness begins to return

The person who faints is usually young and healthy The cause may be mental such as the sight of blood fear of an injection or sudden bad news – or physical such as extreme pain or standing for a long time to attention

The mechanism is not unlike that which causes shock Nerve impulses from the brain allow the capillaries in the muscles and gut to dilate and blood stagnates in these capillaries – temporarily out of circulation as it were Lack of blood supply to the brain produces first giddiness pallor and yawning then unconsciousness As a rule the circumstances in which fainting occurs make the diagnosis obvious

The only treatment needed is to loosen any tight clothing around the neck if consciousness does not return within two minutes the patient should be rolled into the semi prone position (*Fig* 23) and expert help sent for as there may be some more serious cause for the unconsciousness

The patient who feels he is about to faint can usually prevent this by pulling his stomach buttock and leg muscles tight and holding them tight a minute or so

Th t h g stem f om the Med c l R rch Co n l po t on th t tme t of wo nd hock Post war se ch on the co trol of the ol m of flu d the body has r d c ll alte d the *p ctu e*

will be drawn away from the vital places where it is needed and the patient will be worse off rather than better

Following this reasoning it was discovered that shocked patients who were not warmed did as well as or even better than those who were warmed

Moreover if hot water bottles or electric cradles are used there is the additional danger of skin burns during the period when consciousness and sensitivity to pain are diminished

In the Birmingham Accident Hospital the resuscitation room to which all shocked patients are brought is at ordinary room temperature and the patient has only a sheet to cover him We have no doubt that the right first aid management of shock is to dispense entirely with artificial sources of heat Even covering the patient is a matter only of physical comfort in cold weather The traditional hot water bottles can safely be disposed of at jumble sales

Fluids

The shocked patient is often intensely thirsty this is nature s response to blood and fluid loss Part of the traditional treatment for shock is giving hot sweet tea this is now realised to be a dangerous practice As has already been emphasised the first principle in the management of shock is to get the patient to hospital as swiftly as possible On arrival there the surgeon may well decide that besides transfusion immediate operation is essential But the dangers of anaesthetising someone who has just been drinking hot sweet tea or indeed any fluids are considerable for this reason alone the surgeon may have to hold his hand while three or four vital hours slip away With stomach injuries there is the added danger that any fluid drunk will leak out of the stomach or gut into the abdominal cavity

It follows that the only safe rule is *no fluids of any kind by mouth to the shocked patient* The same absolute prohibition applies to giving chocolate or boiled sweets to suck If however the patient complains of thirst he may be allowed to rinse his mouth with water and spit it out

Morphia

The actual giving of morphia is no concern of the factory first aider But he may sometimes have to call the doctor so that morphia may be given Morphia is not a treatment for shock but a means of relieving pain It is needed only if pain is continuous and severe – as for example when a limb is trapped in machinery Obviously it will not be necessary if the patient is unconscious

Because it may take a doctor an hour or more to reach the site of a disaster in a coal mine first aiders in coal mines are given special powers under the law to administer morphia For this they have to be specially trained Full details are given in the St John publication *First Aid in Coal Mines* For similar reasons industrial nurses working in the docks are now allowed to administer morphia

Crush Injuries

Severe crushes with much destruction of muscle tissue involve an added risk besides shock Debris and poisons from the crushed muscle released into the blood may damage or even destroy the kidneys The resulting condition is called the

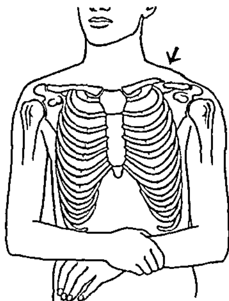


Fig 24 *Broken collar bone or clavicle Note that the broken ends of the bone overlap slightly that the back of the head is turned and tilted towards the injured side that the arm is held against the side of the chest and the forearm supported by the other hand*

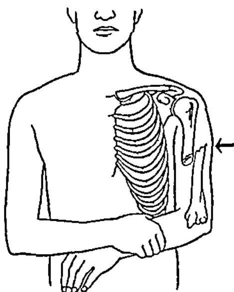


Fig 25 *Broken humerus As with the broken collar bone the arm is held to the side and the forearm supported by the other hand The broken bone ends overlap slightly so that compared with the good side the upper arm is shortened*

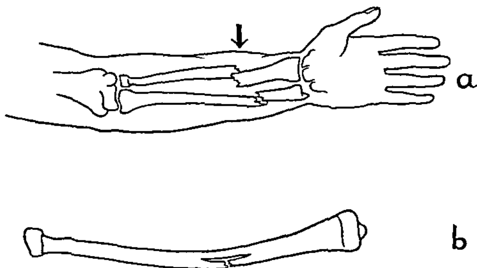


Fig 26 *Broken radius and ulna* (a) *Complete break of both bones* (b) *Partial break of the radius without separation of the broken bone ends the so-called green stick fracture*

Chapter 6

Fractures And How To Recognise Them

A fracture is a broken or cracked bone Fractures are common in street and riding accidents in industrial accidents they are comparatively rare In our experience the bones most often broken in industry are the small bones of the hands and feet usually as a result of objects falling The value of specially strengthened protective boots as a means of preventing fractures especially for workers in heavier industry and the building trades cannot be too strongly stressed Conversely boots or shoes with rubber or canvas uppers are a real source of danger to the worker

Role of First aider

In industry because skilled help can almost always be quickly obtained the first aider s role in fracture treatment is confined to true first aid The transport of a patient with a fracture of the thigh for example is a task for the skilled and experienced ambulance worker who is handling such cases every week Usually the factory first aider s role is to look after such a patient until the expert arrives But with a suspected fracture of the arm hand or foot the factory first aider may well have to get the patient ready for transport as a sitting case to the hospital or industrial health centre

The *seriously injured* patient will often have one or more fractures Here treatment of the patient s general condition must have priority care of the fracture will be limited to making the part as comfortable as possible

With the patient who has sustained a *moderate and local injury* the first aider must always remember the possibility of a fracture In such cases he should send for help or refer the patient to the factory medical department health centre or hospital If there is any reason at all to suspect a fracture he must take special steps to make sure that it gets no worse

Transport of severe fractures is excellently taught in the official first aid manuals The ambulance worker must know all this and so must a first aid worker in a coal mine The factory first aider needs to know only certain basic principles and how to apply them if the need arises But what is known must be known properly

Types of Fracture

Many varieties of fracture are described For the industrial first aider only two are important – closed or simple and open or compound Most fractures are closed Open fractures are so rare that many first aiders will never see one

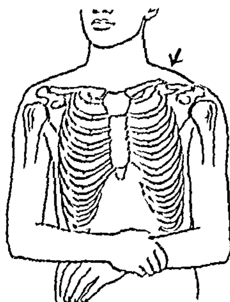


Fig. 24. Broken collar bone or clavicle. Note that the broken ends of the bone overlap slightly, that the back of the head is turned and tilted towards the injured side, that the arm is held against the side of the chest and the forearm supported by the other hand.

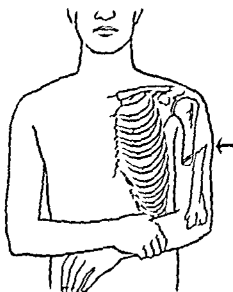


Fig. 25. Broken humerus. As with the broken collar bone, the arm is held to the side and the forearm supported by the other hand. The broken bone ends overlap slightly so that compared with the good side the upper arm is shortened.

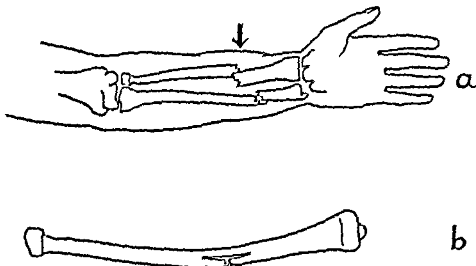


Fig. 26. Broken radius and ulna. (a) Complete break of both bones. (b) Partial break of the radius without separation of the broken bone ends, the so called "green stick" fracture.

An open or compound fracture is one where there is an outside wound as well as a fracture and a communication between the skin and air and the broken bone compound fractures the bone cannot be seen in the wound The best the first aider can tell a compound fracture if there is a broken bone-end sticking out from a wound or through the skin or if broken bone is visible in a wound But in most compound fractures the bone cannot be seen in the wound The best the first aider can do is to say there is a wound outside and a broken bone inside whether they communicate is a matter for the surgeon

The safe rule is to treat the wound as a wound – that is to say cover it as quickly as possible with a large individual sterilised dressing in order to keep out any further infection Once this is done the patient s general condition and the fracture itself can be attended to It is particularly important to handle any such injury extremely gently One rough movement may link together an outside wound and an inside fracture and so convert a closed into an open fracture

Is There a Fracture ?

For the first aider there are only two certain signs of a fracture

1 If the patient is conscious he often says that he heard or felt a bone snap

2 The limb or injured part is often bent in a way which could happen only if the bone was broken This is called the deformity it can usually be detected without removing the clothes Deformity is best appreciated by comparing the injured and uninjured limbs

Everything else must be suspicion only With many fractures including many of those of the fingers and toes wrist and ankle pain is the only indication of trouble and diagnosis is impossible without an x ray The only safe course is for every injury with pain over or near a bone to be seen by a trained nurse or doctor

Fractures of Individual Bones

Here we are concerned with bones other than the spine which will be considered later Certain bones are particularly liable to get broken Often the deformity or change in shape produced is so characteristic that by simply looking at the injured part it is possible to tell that there is a fracture Here pictures speak louder than words Each illustration should be studied carefully as the text is read In particular attention should be paid to the way the displacement of the broken bones produces changes in the outside shape of the part of the body affected

Collar bone or clavicle (Fig 24)

The cause is usually a fall on the outstretched hand The arm is held tight against the side of the chest and any movement gives pain over the collar bone

Upper arm bone or humerus (Fig 25)

Again the arm is held tight against the side of the chest but this time pain on movement is over the broken humerus

Forearm bones the radius and ulna (Fig 26)

The injured forearm is supported with the other hand There will be pain at the

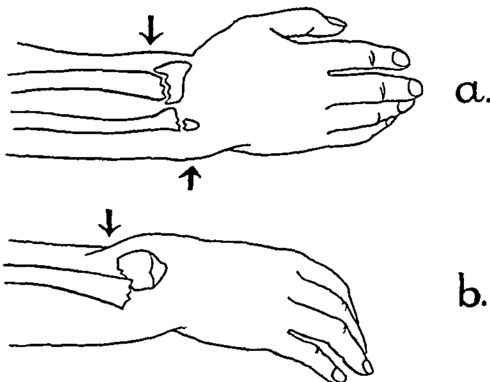


Fig 27 *Broken wrist* (a) *From the back the wrist merely looks swollen* (b) *The break is really of the forearm bones just above the wrist Note that the dinner fork deformity is seen only in side view For simplicity only one bone the ulna is shown*

site of the break The amount of deformity depends on the extent of the breaking A young person may crack one of the forearm bones only part of the way through this is called a green stick fracture If one bone alone is broken the other will act as a splint

Forearm bones at the wrist (Fig 27)
The common cause is a fall on the wrist particularly in an elderly woman The fracture is called Colles s fracture and the deformity seen from the side is like a dinner fork

Small bones of the wrist and hand
The usual causes are jerks falls and blows Chauffeurs fracture may follow a back fire while using a starting handle though now rare with cars it still occurs with diesel engines

Thigh bone or femur at the hip (Fig 28)
The femur is the largest bone in the body and breaks always produce considerable shock In old people the femur is fragile and a simple fall will snap the neck of the femur close to the hip joint The deformity is quite characteristic The leg is

held rolled outwards so that the toes point away from the other foot Sometimes it can be seen that the injured leg is shorter

Shaft of the thigh bone (Fig 29)

Because it is so strong the shaft of the femur will be broken only by great violence

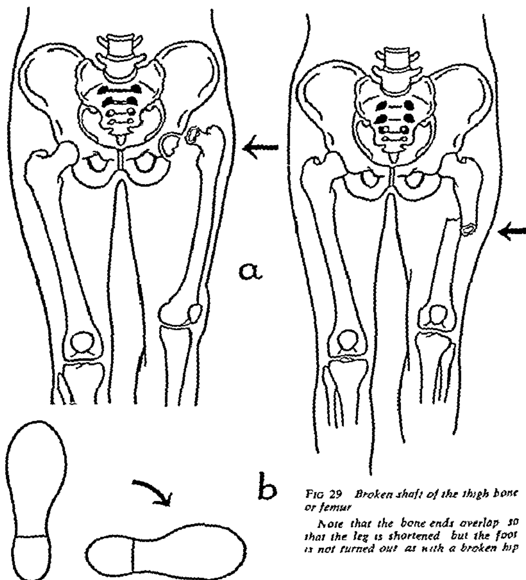


Fig 29 *Broken shaft of the thigh bone or femur*

Note that the bone ends overlap so that the leg is shortened but the foot is not turned out as with a broken hip

Fig 28 (a) *Broken thigh bone or femur at the hip Though usually spoken of as a "broken hip" the injury is really a break of the narrow "neck" of the femur The main shaft of the femur is pulled up by the powerful thigh muscles so that the injured leg is made shorter than the other* (b) *Position of feet with a "broken hip" The toes of the injured side point outwards instead of forwards*

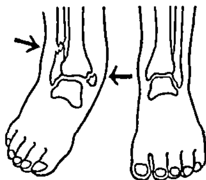


FIG 31 *Broken ankle The break is really of the shin bones just above and at the side of the ankle The swelling is usually so great that the break can be detected only by x ray examination*

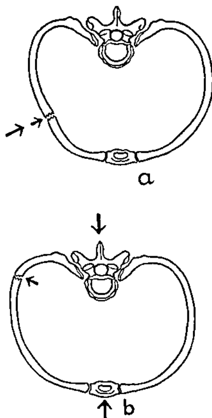


FIG 32 *Broken rib Diagrammatic sectional view Large arrows show direction of forces producing injuries small arrows position of injuries Break produced* (a) *by direct force* (b) *by compression of chest*

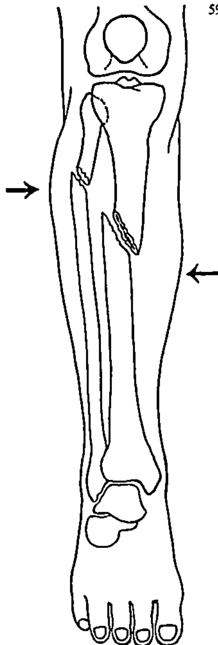


FIG 30 *Broken shin bones The large shin bone the tibia lies just under the skin so that the break may be felt by running the finger down the bone A break of the small shin bone the fibula cannot be detected in this way If both bones are broken the ends overlap so that the leg is shortened*

such as a fall from a height or a bad traffic smash up Pain and tenderness will be extreme the leg will be held quite still there may be shortening

Shin bones the tibia and fibula (Fig 30)

The large shin bone the tibia is just under the skin so a break can be felt quite easily by running a finger along it As a rule the thin little fibula is broken as well The common causes are football injuries road accidents and falls

Shin bones at the ankle (Fig 31)

It is usually impossible for the first aider to distinguish a badly strained ankle from a broken one The cause is usually a twist or a fall often a slight one Sometimes the whole foot is pushed backwards on the leg, the characteristic deformity of Potts s fracture in which besides the broken bones the ankle is dislocated

Small bones of the ankle and foot

Fractures should be borne in mind whenever a weight is dropped on the foot or toe

Ribs (Fig 32)

Rib fractures are common They may be caused by sudden compression of the chest or by falls for example on the corner of a workbench There is usually no deformity but sharp pain on breathing or coughing

Skull

With head injuries the general condition of the patient matters much more than the local damage Falls blows and road accidents are the usual causes Often the patient will be drowsy or unconscious Blood from the nose or ear following a blow on the head suggests a broken skull

A bad bruise on the scalp may feel like a fracture of the skull there is a raised circular swelling with an apparent dip or hole in the centre Usually there is no break but this is a matter for a trained nurse or a doctor to decide

Chapter 7

Care of Fractures, Strains and Sprains

The principle of first aid care of any fracture is to steady the broken bone-ends so that the patient can move or be moved without added pain or further injury

1 The injured part should be steadied and supported to prevent movement of the broken bone-ends With long bones this means that the joints at each end of the broken bone must be held still

2 If the limb is in a very unnatural position it should be moved with great care and without force into as natural a position as possible If it is not in a very un natural position it should not be moved

3 If the patient is to move or to be moved without further expert help the injured part should be fixed in a comfortable natural position Fixing is done with triangular bandages opened out or folded plenty of cotton wool padding and with the body the other limb or a piece of wood used as a splint

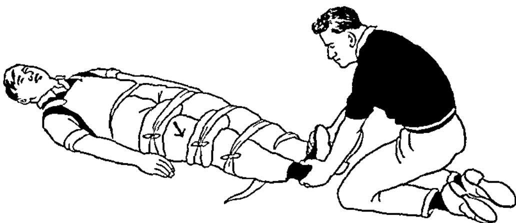


FIG 33 *Splinting a broken hip thigh or shin For simplicity the first aider doing the bandaging is not shown The arrow indicates the position of the suspected break An assistant exerts a steady pull on the foot without bending or turning it while the bad leg is tied to the good leg with folded triangular bandages Plenty of cotton wool is placed round the injured limb before the two bandages are applied just above and below the fracture*

4 Do not try to remove the patient s clothes this may do further damage by moving the broken bone ends In some of the pictures certain clothes are shown removed only for the sake of clarity

Fixing of Hip, Thigh and Shin Fractures

Patients with fractures of the hip thigh and shin will normally be transported to hospital by ambulance as quickly as possible Any splinting needed will therefore usually be done by the expert ambulance men

If for any reason the factory first aider does have to splint a fractured hip thigh or shin the safest way is to tie the two limbs together with four to six folded triangular bandages Should an assistant be available he may at the same time exert a steady pull on the foot without bending or turning it in any way This pull is to overcome or at least reduce the muscle spasm around the fracture which is the main cause of the pain (*Fig* 33)

Plenty of cotton wool should be placed round the injured limb before the two

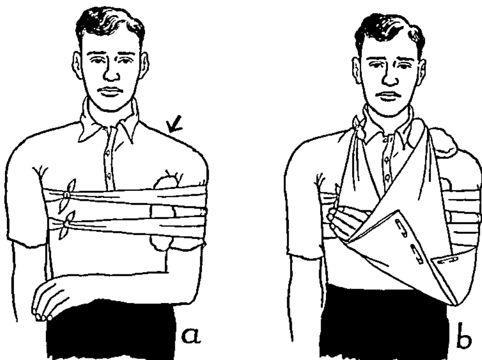


FIG 34 *Fixing a broken collar bone* (a) *A pad of cotton wool is placed in the arm pit and the upper arm bound to the side of the chest by two folded triangular bandages* (b) *The forearm is supported in a sling at an angle of 45 degrees and a large cotton wool pad placed between the sling and the injured shoulder Alternatively a clove hitch* (FIG 12) *may be used or by those who have learnt its use the special St John sling*

bandages are applied *on either side* of the fracture Never bandage directly over a fracture

On no account should any attempt be made to remove the clothes It is reasonable however to roll up the trouser or pull down the stocking to see if a fractured shin bone has penetrated the skin

Once the limb is properly immobilised the patient may be lifted carefully on to a stretcher

Moving Other Fractures

Patients with severe head injuries will go straight to hospital under expert care they will usually be unconscious and the fractured skull as such needs no first aid Details will be given later when the unconscious patient is considered

Unless they are shocked patients with fractures or suspected fractures of the arm and forearm wrist and ankle hand and foot collar bone and ribs can be moved to the factory medical department health centre or hospital by car as sitting patients For such patients then first aid fixing may be necessary

Fixing of Other Individual Fractures

Collar bone (*Fig* 34)

Put a cotton wool pad in the arm pit Bind the upper arm to the side of the chest with two triangular bandages Support the forearm in a sling at an angle of 45 degrees Place a large cotton wool pad under the sling end which passes over the injured collar bone

Humerus (*Fig* 35)

Use the side of the chest as a splint Place a large cotton wool pad between the arm and the chest Bind the arm to the side of the chest with two triangular bandages Support the forearm in a sling at a right angle

Radius and Ulna (*Fig* 36)

Pad with cotton wool a splint long enough to extend from the elbow to the junction of the fingers and hand Fix the splint to the forearm and hand along the palm surface with a bandage at either end Place cotton wool pads on each side of the fracture and bandage over these

This treatment also applies to fractures of the radius and ulna at the wrist or other doubtful wrist injuries

Ankle

Pad all round with cotton wool and bandage firmly No weight should be borne on the injured ankle

Hands and feet

Fractures of the small bones of the hand and foot fingers and toes require no first aid splinting The injured hand should be rested in a sling No weight should be borne on the injured foot

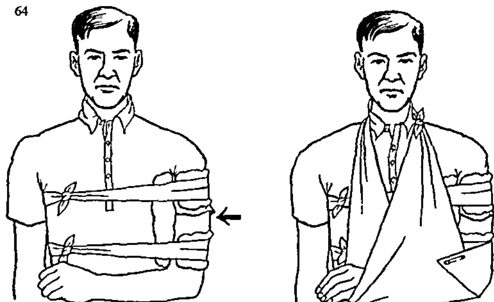


FIG 35 *Fixing a broken humerus* (Left) *The side of the chest is used as a splint A large pad of cotton wool is placed between the arm and the chest and cotton wool placed round the arm above and below the break The arm is bound to the chest with two folded triangular bandages* (Right) *The forearm is supported in a sling at a right angle*

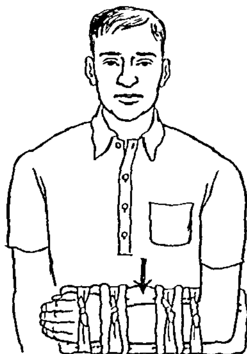


FIG 36 *Fixing a broken radius and ulna A simple splint padded with cotton wool extends from the elbow to the knuckles along the palm surface of the forearm and hand Note the cotton wool pads under the bandages on each side of the fracture The forearm is carried in a right angle sling (not shown)*

Ribs

Fractures of the ribs require no first aid splinting If pain is extreme this may be eased by propping up with several pillows

Whenever bandages or slings are used for fixing fractures these must be secured firmly enough but not too tight. Too tight a bandage will cause the part below it to start to swell

Fractured Spine

The spine may be broken in the neck or the back A broken *neck* may follow diving into a pond which is too shallow More commonly nowadays it follows the sudden stop when a car motor-cycle plane or train crashes The head jerks forward or backwards and snaps the neck in much the same way as in judicial hanging

A broken *back* may follow a fall from a height such as scaffolding it may happen regardless of whether the head or feet buttocks or back strikes the ground first The back may also be broken by direct violence – for example when a heavy weight falls across the back

The damage to the bone is comparatively unimportant What matters is damage or the risk of damage to the spinal cord inside the bone Any damage to the spinal cord is absolutely permanent There can be no recovery from the paralysis (loss of movement of muscles) and loss of sensation below the level of the damage

Because movement of the broken spine may itself produce damage to the spinal cord the first aider shou'd do *absolutely nothing* unless he has to

The first aider will suspect or recognise a broken spine by the following (1) the story of the accident (2) pain at the place of injury (3) the patient feels afraid to move and may be unable to move if he tries

If it is absolutely necessary to move the patient or adjust his position it must be done very gently and slowly The greatest care must be taken not to bend up the back or neck or twist the spine How *not* to do it is shown in *Fig* 37

For anything more than the slightest movement head and foot traction should be used preferably with four people helping (*Fig* 38) But it must be emphasised that this is a job for expert first aiders who have practised the manoeuvre carefully

If lifting is absolutely necessary then the opportunity should be taken to put the patient on to a flat hard stretcher without pillows or on to a door

But the proper course is always to wait for the expert *ambulance men* unless there is an overwhelming reason for not doing so

If the patient with a broken back is found lying on his face he may with advantage be transported on his face

With a broken neck the patient should be moved on his back with his head supported between two rolled blankets sand bags or bricks wrapped in cotton wool

The Recovering Fracture

The modern orthopaedic surgeon usually wants to get most of his fracture cases back to work as soon as possible sometimes even within a day or so of the injury Early suitable work is the finest possible way of keeping a patient generally fit

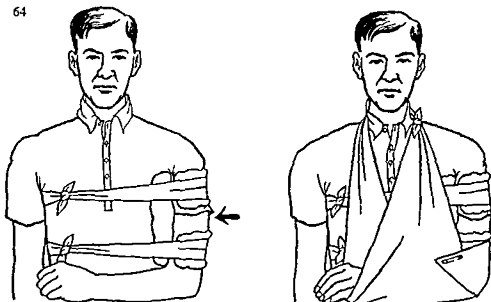


FIG 35 *Fixing a broken humerus* (Left) *The side of the chest is used as a splint A large pad of cotton wool is placed between the arm and the chest and cotton wool placed round the arm above and below the break The arm is bound to the chest with two folded triangular bandages* (Right) *The forearm is supported in a sling at a right angle*

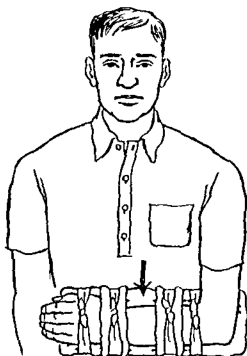


FIG 36 *Fixing a broken radius and ulna A simple splint padded with cotton wool extends from the elbow to the knuckles along the palm surface of the forearm and hand Note the cotton wool pads under the bandages on each side of the fracture The forearm is carried in a right angle sling* (*not shown*)

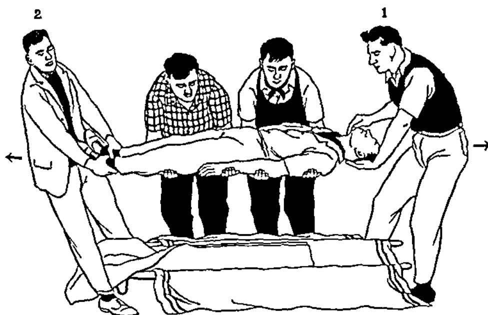


FIG 38 *The right way to move a patient with an injured back The patient s spine must be kept absolutely straight and head and foot traction applied at the same time The first man places one hand under the patient s neck and the other under his chin he keeps up a steady pull on the neck with the head bent back The second puts his hands around the patient's heels All four men must move very slowly and carefully and in complete unison It is best however not to move the patient at all but to wait for the expert ambulance men*

Strains and Sprains

A *strain* is an injury to a muscle or tendon A *sprain* is an injury to a joint With both strains and sprains the first aider s prime duty is to make sure that other and more serious injury is not being passed by undetected Often the decision will be beyond him indeed even the most experienced expert may need an x ray to make sure It follows that if there is the least doubt the patient should be referred to a trained nurse or doctor

Strains

The story of a strain is usually characteristic Sharp pain in a muscle or tendon follows a sudden effort The affected part is held stiff The muscles most commonly strained are those of the back

A severe strain may involve the complete rupture of a muscle or tendon The pain is more severe there may be great swelling and the affected part cannot be moved Such cases will probably need surgical treatment

A simple strain need not be rested active movement from the start hastens recovery To relieve pain a cold compress may be applied Treatment with an infra red lamp is also helpful though such treatment is outside the scope of first aid it is



Fig 37 *How not to move a patient with an injured back It is called jack knifing If the spine is injured it is certain to cause damage to the spinal cord*

Such patients often need encouragement to make the necessary effort Here the first aider on the shop floor can play a valuable part He can also offer certain practical advice

A plaster splint should not be covered with a rubber glove the retained sweat softens the plaster For similar reasons it is important not to rub a plaster or to get suds or water on it The patient with crutches or in plaster must be encouraged to move around from time to time and not remain sitting in one place The rubbers on the ends of crutches must be in good repair

often available in the factory medical department or industrial health centre

Many industrial strains particularly those of the back can and should be prevented Modern mechanical handling methods can get rid of much back breaking toil When manual labour cannot be avoided its proper technique should be learnt the motive power should come from the hip and thigh muscles with bending at the hips and knees rather than from the back muscles with bending at the spine (*Fig* 39) There is too a right and a wrong way to carry heavy objects (*Fig* 40) *

Sprains

Sprains are produced by the same kinds of injury which produce fractures Indeed both are often present and it is only possible to make sure no bones are broken by taking an x ray picture

In a sprain the ligaments and other soft parts around the joint are either stretched or actually torn The story is usually of either a twist or a wrench There is pain at the point of injury and the joint is held stiff Swelling may be considerable

Among the commonest sprains are the footballer s sprained knee and the sprained external ligaments of the ankle Like strains sprains are best not rested but moved actively from the start A cold compress will relieve pain Cotton wool and a firm bandage will give comfort this is the best first aid treatment

If the pain is not too bad the boot should be left on as it makes a good splint the laces however should be loosened If the pain is very severe the cause is usually pressure from the swelling the boot must then be removed Once the boot is taken off it will be hard if not impossible to get it back on again

Dislocations

A dislocation is the displacement of one or more bones at a joint Dislocations are much less common than either fractures or sprains

There is loss of movement in the dislocated joint and the joint looks peculiar The pain is often described as sickening Often the patient can tell what has happened With some joints it may have happened before

The joint most commonly dislocated is the shoulder usually following a fall on the outstretched hand next the jaw usually following a big yawn next the ankle usually with a fracture as well Thumb and finger joints are sometimes dislocated especially at football It needs great violence to dislocate either the elbow or the knee

The first aid treatment is to support the part beyond the dislocation in the position of greatest comfort and to get expert help The first aider must never himself try to put back a dislocation as by doing so he may cause a fracture

* An excellent pamphlet *Lifting and Carrying* price 1s has recently been published by HM Stationery Office for the Ministry of Labour and National Service

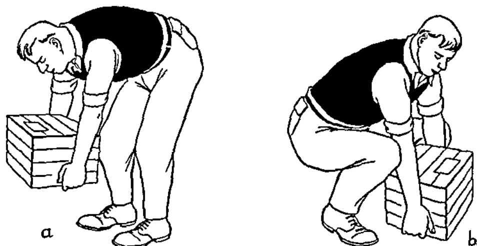


FIG 39 *Lifting a heavy weight* (a) *The wrong way is to use the muscles of the back under great strain these muscles may tear o a weak spinal disc may slip The feet are together the knees are straight and the back is bent* (b) *The right way is to use the great muscles of the hips and thighs The feet are apart the knees are bent and the back is straight*

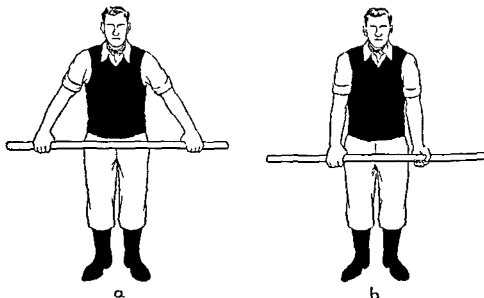


FIG 40 *Holding an iron bar* (a) *The wrong way with the arms at an angle to the chest and both hands on the same side of the bar places unnecessary strain on the comparatively weak shoulder joints and on the fingers the bar can easily slip and injure the feet* (b) *The right way involves a minimum of physical effort and reduces the chances of the bar slipping*

often available in the factory medical department or industrial health centre

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Chapter 8

Burns and Scalds, Electrical and Heat Injuries

A burn is tissue damage produced by dry heat a scald is damage by wet heat Tissue damage produced by the direct action of a strong chemical is referred to as a chemical burn

The seriousness of any burn depends on four factors area depth part of body *affected and the age of the patient*

Area of Burn

The skin area involved* in a burn is more important than the depth Even a super ficial burn involving more than 5 per cent of the body surface is serious if more than 15 per cent of the surface is involved the condition is extremely dangerous and the patient may die of shock unless blood transfusion is started within an hour or so

In all large burns there is severe shock due to the great quantities of fluid lost both from the raw surface and into the damaged tissues as shown by the swelling of the burnt part Naturally the larger the burnt area the greater the shock

Burning sterilises the tissues but the damage and the exposure of a large raw area greatly increase the chances of subsequent infection The greater the area the greater the infection risk Good first aid will help to keep the burn clean and infection free bad first aid may itself introduce infection

Depth of Burn

For practical purposes two depths of burn have to be recognised

Superficial burns Only the outer layers of the skin are affected The burnt area goes red and blisters may or may not form Pain is considerable but the burn usually heals rapidly as a rule there is little scarring Large superficial burns produce considerable shock

Deep burns All the layers of the skin are damaged and the fat and muscle beneath the skin and even the bone may be involved The burnt area is yellowy white or actually charred If the skin is completely destroyed there will be less pain than in superficial burns because the sensitive nerve endings in the skin will also have been destroyed Deep burns often become infected They heal very slowly and scarring is often serious

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Part of Body

Burns of the face and hands are more serious than burns of corresponding size elsewhere because quite small scarring may upset both function and appearance

Age of Patient

Children and old people react badly to severe burns Moreover they are particularly liable to extensive burns

Varieties of Burn

Dry heat burn may be caused by contact with hot metal–for example a soldering iron or an unprotected hot water bottle The burn is sharply localised and may be superficial or deep

Fire burn may follow a blow back from a boiler or involvement in flaming petrol or other solvent or a burning building the clothes usually catch fire Such a burn often covers a large area parts of it may be superficial and other parts deep Charred clothing may be stuck to the burn The patient is usually very shocked

Sunburn may follow exposure to natural or artificial sunlight It is very superficial but there is often considerable reddening and blistering

Friction burn is a rare type of burn It is caused through catching hold of a rapidly moving rope – for example a haulage rope in a mine

Electrical and chemical burns will be considered in detail later

Wet burns or scalds may be caused by steam hot water hot oils fats (for example cooking fat) hot solvents or tar They are usually superficial but are often extensive and therefore serious They are common among young children especially when a child tries to get a kettle or saucepan off a stove

Atomic flash burn is caused by the flash of intense heat from an exploding atomic bomb The heat generated is so great that although only instantaneous it can cause superficial burns on the exposed skin of people two miles away Complete protection is given by anything which shades the skin from the white hot flash – for example clothing buildings or trees Flash burns are serious only if the area of skin is large

First Aid Treatment of Burns

In treating a burn or scald the objectives are to prevent shock avoid infection and relieve pain The first aider must not allow anything bacteriologically dirty to be put on the burn – for example grease or ointment from some dirty old pot which has been standing on an open shelf for months or years He must not touch the burn with his hands and should speak as little as possible until the burn has been covered with a clean or sterile dressing

For treatment purposes burns are divided into trivial medium and serious The first aider can safely treat the trivial burn himself but any medium burn that is to say one larger than a farthing or an average cigarette burn ought to receive expert treatment from a trained nurse or a doctor so that the chances of infection may be kept to a minimum The serious burn involving more than a few square inches of skin will be sent direct to hospital

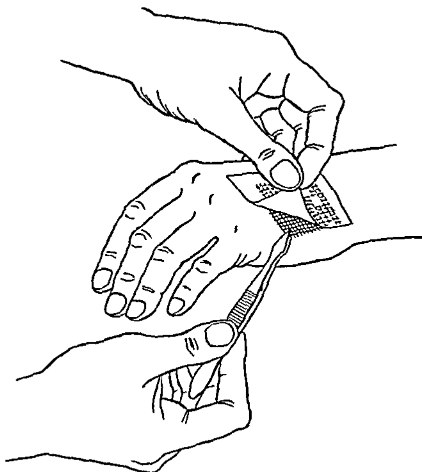


FIG 41 *Applying tulle gras dressing to a minor burn The dressing is held in place at one corner with forceps while the slip of grease proof paper is pulled off with the free hand*

Trivial Burns

Trivial burns should be carefully cleaned with cetrimide or soap and water and cotton wool in the same way that minor wounds are dealt with After cleaning the burn and surrounding skin should be dried with clean cotton wool and covered with an individual sterilised tulle gras dressing The dressing is contained between two slips of transparent paper One slip is pulled off and the dressing still attached to the other slip is applied The second slip is then quite easily removed leaving the sterilised tulle gras in place In applying the tulle gras the first aider must take care not to touch the dressing except at the corners or edges in separating it from the slip of paper forceps will be helpful (*Fig* 41) If the tulle gras is too large it should be cut to the right size before the slips of paper are removed The tulle gras is

covered with a small individual sterilised dressing an individual plaster or clean cotton wool and a roller bandage

If there is a blister it should not be pricked and the first aider should not try to remove dead skin

Medium Burns

Since thorough cleansing of the burnt area will be undertaken by the doctor or nurse the first aider s duty is simply to cover the burn with one or more individual sterilised dressings and to get the patient to the expert as quickly as possible There is no point in putting tulle gras on any burn which is to be efficiently cleaned within an hour or so any oil or grease applied by the first aider simply makes the cleaning more difficult

Serious Burns

No attempt must be made to clean the burn or to remove the clothes or to pull away any charred clothing which has stuck to the burn the burning will itself have sterilised the whole area The burnt area must be quickly covered with one or more large sterilised individual dressings If the area burnt is too extensive even for this a clean towel or sheet may be used as a covering At hospital cleaning will be undertaken with full surgical precautions in an operating theatre

Rapid replacement of body fluid lost is the life saving treatment in such cases so rapid transport to hospital is literally vital As a rule attempts to carry out blood transfusion or even intravenous saline infusion outside hospital do more harm than good by delaying full scale controlled fluid replacement They are now resorted to only when the patient is trapped and cannot be quickly released or where the journey to hospital will probably take a long time

The general treatment of shock as set out earlier must be followed If the patient is thirstv he may wash out his mouth and spit out Only if there is likely to be considerable delay in getting the patient to hospital may water drunk in small sips only be permitted larger quantities of fluid taken suddenly may cause vomiting With small burns hot sweet tea is harmless and comforting and may be given

Rescuing from a Burning Building

The following rules should be observed in rescuing a patient from a burning building

1 The rescuer should cover his nose and mouth with a cloth soaked in cold water This helps to keep the hot over dried air out of the lungs

2 He should crawl on his hands and knees Because hot air and smoke rise the coolest and purest air is to be found nearest the floor

3 He should feel any door he comes to before opening it If it is very hot it should be opened with great caution so that he is not caught in a blast of hot air and flame which may come out

4 The patient will probably be best moved by tying his hands together and hitching his arms over the rescuer s neck The rescuer can then crawl along pulling the patient s body beneath his own body Further details of the neck drag as this method of transport is called will be given later

Danger from Fire Extinguishers

Many fire extinguishers work on the principle of releasing a non inflammable gas much heavier than air Two of these gases are carbon tetrachloride (used in the Pyrene extinguisher) which is 5 3 times heavier than air and methyl bromide which is 3 3 times heavier than air and unlike carbon tetrachloride has no smell Both chemicals are effective fire extinguishers but both may be poisonous if inhaled Carbon tetrachloride is the less dangerous of the two but at high temperatures may be converted into dangerous phosgene gas If fire extinguishers have been used the gases produced will be concentrated at floor level and crawling on the hands and knees will no longer be the safest approach for the rescuer

Electric Burns

Electricity may cause burns electric shock or both Burns occur at the points of entry of an electric current that is the points of contact with a live conductor A common cause is worn electric cable of a portable hand tool such as a soldering iron or drill especially if there is inadequate earthing A much more severe burn with extensive charring of the tissues will follow contact with a high tension supply Indeed the heat and destruction from a high tension contact are so great that the path of conduction is broken and the worker runs away with his clothes on fire

A mild electric current may produce a pattern on the skin like the branches of a tree or the meshes of wire netting This is probably because the electricity flows along the trickles of sweat on the skin A moderate current will produce a dry shrivelled burn with great pain – much more than from a heat burn of the same size There is little or no reddening around the burn and the burnt tissue takes the form of a cone with the point inwards extending down from the skin into the deeper structures Quite a small burn may involve tendons and other important structures and this may not be apparent for three or four days

Sometimes as well as the burn at the point of entry of an electric current there may be a similar burn at the point of exit For example where the entry burn is on the hand there may be an exit burn on the foot

Treatment

Even the smallest electric burn should be covered with a clean dry dressing and referred to a nurse or doctor The devitalisation of the tissue around the burn will delay healing and increase the risk of infection The best treatment may often prove to be a small skin graft usually applied in the out patient department

Electric Shock

Electric shock is the general bodily reaction to the passage of an electric current It may vary from slight tingling to sudden unconsciousness looking just like death But the first aider must never presume death in electric shock for the breathing may stop and the pulse vanish yet life can still be restored

Direct current is said to be less dangerous than alternating current for the following reason Direct current produces a single violent muscular contraction which tends to throw the patient away from the source of the shock Indeed the resulting fall is as likely to cause injury as the shock itself By contrast alternating current produces continuous muscle spasm which may cause the affected muscles of the arm and hand to grip involuntarily the

source of electric supply So a continuous prolonged shock is more likely For this reason an electrician who is unwise enough to test a source of alternating current by touch will do so with the back of his hand!

Voltages under 150 250 are rarely fatal and occasionally 800 volts have been survived The lowest fatal voltage ever recorded was 38 A great deal depends on the contact between the source of electricity and the skin and between the skin and the ground If the skin clothes or shoes are wet or moist the shock is correspondingly greater and its effects correspondingly worse A metal floor will also increase conductivity A person who is fatigued stands shock worse than one who is fresh

With very high voltages the current usually does not penetrate the body deeply because the electrical pressure is so great that the tissues and conductors are destroyed

Ordinary domestic AC current alternates at 50 cycles per second Such a current can just be felt if it is of one milliamp By contrast a DC current has to reach 5 milliamps before it is perceptible One hundred milliamps AC is the usual minimum fatal current but as low a figure as 20 milliamps AC has caused death The length of duration of exposure to a current is very important with exposures of over 5 seconds the danger of serious injury is great

The skin has a very high electrical resistance about 3 000 ohms if dry and healthy Once this resistance is overcome the current follows the internal water courses of the body A current passing from leg to leg does less harm than one passing from arm to leg since the latter will pass over and often damage the electrical mechanism of the heart A current passing from head to leg as in judicial execution will travel via the fluid around the brain and spinal cord damaging vital electric control centres on its way

Most electric shocks occur among works and maintenance engineers A third of all fatal electrical accidents are due to portable electrical apparatus and hand tools

A severe electric shock may occur during electric welding where a sweaty worker is lying in contact with a metal sheet which may become live A fatal shock may be caused by a jib crane fouling an overhead cable or a metal strip may touch the live overhead wires feeding an electric gantry

Symptoms

These may vary from muscle spasm and pain to unconsciousness and even deep coma The muscle spasm may be momentary with a single direct current shock or continuous from alternating current Pain in the affected muscles may be intense Inasmuch as the patient cannot overcome the spasm of the muscles by an effort of will the muscles are effectively paralysed as long as the shock *continues*

If it is strong enough the electric current may paralyse the breathing muscles or put the breathing control centre in the brain out of action It cannot be too strongly emphasised that such a paralysis is usually transitory At the same time the electric current may partially paralyse the heart muscle As a result the heart beats rapidly but feebly in a state of flutter in this state although the blood is still circulating the pulse cannot be detected It follows that absence of both pulse and respiration in a patient unconscious from electric shock are *not* signs of death Prolonged artificial respiration may yet save life

Treatment

Speed and coolness are essential and may be life saving The first move is to disconnect the patient from the source of the electricity

1 Switch off the current

2 If this is impossible pull or push the patient away from the source of the

Danger from Fire Extinguishers

Many fire extinguishers work on the principle of releasing a non inflammable gas much heavier than air Two of these gases are carbon tetrachloride (used in the Pyrene extinguisher) which is 5 3 times heavier than air and methyl bromide which is 3 3 times heavier than air and unlike carbon tetrachloride has no smell Both chemicals are effective fire extinguishers but both may be poisonous if inhaled Carbon tetrachloride is the less dangerous of the two but at high temperatures may be converted into dangerous phosgene gas If fire extinguishers have been used the gases produced will be concentrated at floor level and crawling on the hands and knees will no longer be the safest approach for the rescuer

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is lost as sweat, or if the surrounding air is so full of water vapour that the sweat cannot evaporate the body cuts down on further sweating and the internal temperature starts to rise If this is allowed to continue true heat stroke develops

Symptoms

Heat exhaustion The skin is clammy and the patient irritable he complains of severe cramps in the limbs

Early heat stroke The skin is hot and dry and the irritability and cramps are much more severe

Second stage of heat stroke The patient may be found unconscious breathing hard and sometimes twitching a little The skin is dry red and burning hot

Prevention

Among those specially liable to heat exhaustion and heat stroke are stokers especially marine stokers in the tropics steel workers and miners So workers at furnaces and in foundries glass works and other very hot places should be provided with special salt drinks *ad lib* which may be flavoured with orange or lemon and glucose The workers concerned soon learn for themselves how much salt drink they require to meet their differing individual needs

Working in air tight rubber protective clothing may produce heat exhaustion and heat stroke especially if the weather is warm The layer of air between the skin and the protective clothing soon becomes saturated with sweat so that an artificial humid atmosphere is produced If such clothing is essential for heavy work its outside should be soaked in cold water The evaporation of this water will cool down the worker inside

In very hot conditions as much as half to one pint of sweat may be lost per hour and this must be made good by fluid intake

Treatment

The patient should be removed from the heat stripped to the waist and bathed or sprinkled with cold water He should then be fanned with towels to encourage the evaporation of the water which will cool the patient still further These cooling processes must be stopped when the patient s temperature has fallen to 100 degrees Fahrenheit.

If the patient is conscious or as soon as he becomes conscious he should be given copious draughts of cold water with a saltspoonful of common salt per tumbler and orange or lemon to improve the taste

On recovery the patient should rest quietly for a time the length of the rest depending on the severity of the attack All cases of heat exhaustion or heat stroke should be seen by a doctor or nurse before returning to work

Sunstroke

This is usually a combination of heat exhaustion and ordinary fainting It is particularly liable to occur in those who are suddenly exposed to the heat in unsuitable clothing Its treatment is the same as for heat exhaustion

electricity while taking great care not to make electrical contact with either the ground or the patient

(a) Stand or kneel on a dry non-conductor such as a dry rug mackintosh or rubber mat

(b) Pull or push the patient away from the source of the electricity again using a dry non conductor Considerable force may be needed to get the patient free

If the patient has to be grasped use special heavy rubber gloves or dry sacking a dry coat or several thicknesses of dry paper Domestic rubber gloves give no protection against high voltages If a crooked stick is available this may be used but not an umbrella since it has metal ribs

(c) Avoid contact with any part of the patient which may be moist for example the arm pits or crutch or the face which may be wet with spittle

3 With very high voltages – for example at electricity stations or in overhead wires – the patient will usually have been thrown clear If not the danger to a rescuer while the current is still on is very great and all possible precautions must be taken Every effort should therefore be made to get the electricity workers to switch off the current before rescue is attempted

Once the patient has been rescued from contact with the electric source if breathing has ceased or is very feeble artificial respiration should be started at once using the methods described later At the same time the standard treatment for shock in an unconscious patient should be applied but this definitely takes second place to artificial respiration Since artificial respiration may have to continue for an hour or more a rocking stretcher is of the greatest value

In about half of all electrocution cases with cessation of breathing there is recovery with artificial respiration nine out of ten patients who start breathing again do so within half an hour of artificial respiration being started There is no record of recovery after electrocution where artificial respiration has had to continue for more than an hour But carry on! Yours may be the first case

Delay in starting artificial respiration can prove disastrous If it is started *at once* 70 per cent of the patients recover If there is more than three minutes delay only 20 per cent recover The lesson here is obvious

First aid workers should get to know the position of the electrical switches in the part of the factory for which they are responsible

Heat Injuries

True *heat stroke* is a rare and somewhat dangerous condition which occurs when the overheated patient has neglected treatment and continued for some time in a very hot environment The first and much more common effect of too much heat is *heat exhaustion* This is also known as miners or stokers cramp

Cause

The essential cause is loss of too much body water and body salt as a result of too little replacement to make good what has been lost by sweating Sweating is part of the natural mechanism of cooling the body It is not the production of sweat but its evaporation from the body surface which uses up body heat and so lowers the body temperature If the body is getting too little water and salt to replace what

Nitric acid is a fuming liquid acting even more quickly than hydrochloric acid It is used in the chemical explosives and pottery industries It produces a yellow brown skin burn

Nitro hydrochloric acid is a mixture used for cleaning glass ware

Sulphuric acid is used in metal pickling copper cleaning and in the electric battery and chemical industries It is similar in action to nitric acid

Slow-acting Acids

With slow acting acids there is no immediate pain so that the patient may not know that he has been in contact with the acid for a period of half an hour to four hours By then the acid will have penetrated deep into the tissues

Hydrofluoric acid a powerful and dangerous acid is used for cleaning and etching glass removing faults from pottery and so on The affected skin becomes dead white Inhalation of its fumes may produce ulcers inside the nose

Hydrobromic acid is a similar but rather less powerful acid and is used in the photo graphic industry

Carbolic acid and the phenols cresols and lysols all act similarly Long contact may lead to burns or even absorption through the intact skin The exposed skin is dead white and puckered

Oxalic acid used in printing dyeing leather and straw hat making is the slowest acting of the four It affects particularly the fingers and may damage or destroy the nails

Similar damage around the nails may be produced by selenious acid used in rectifier manufacture and for photo-electric cells

Treatment of Acid Splashes

Again it must be emphasised that with either type of acid speed is vitally important

1 Wash off the acid immediately with a large volume of water from a tap shower or bath Go on washing until the neutralising antidote is available

2 If water is not available the acid should be dabbed off the skin with cotton wool a clean rag or a handkerchief Any wiping movement must be avoided for this tends to spread the acid

3 If an antidote is immediately available in large quantity it should be used instead of water but it must be used freely and copiously If there is only a small supply it should be applied as soon as the affected part has been completely flooded and douched with water The antidote here recommended is *buffered phosphate solution* * which has the valuable property of neutralising both acids and alkalis If this is not available a solution of bicarbonate of soda (? tablespoonfuls to o pint of water) may be used

The effectiveness of buffered phosphate solution may be demonstrated to a class by using bromo thymol blue indicator A rack of test tubes and some dilute acid and alkali will be needed Bromo thymol blue turns yellow with acid and deep blue with alkali If in the presence of the class enough buffered phosphate solution is added to either the acid or the alkali an apple green colour is produced, indicating neutralisation without a swing over in the opposite direction For successful demonstration a little previous experimenting is needed with the amount and strength of acid and alkali that is added to the indicator Otherwise the test tube may not hold enough buffered phosphate to give full neutralisation

4 If the clothes are contaminated with acid they should be removed at once [illegible]

* B ff ed pho phate lut on may b obt ned from a chemist or [illegible] [illegible] ded ici form la is KH_2PO_4 [illegible] gm Na_2HPO_4 [illegible] gm [illegible] t lled w t — 1 lit

Chapter 9

Chemical Injuries and Poisons

Injuries and burns due to chemicals are far more common in industry than in domestic life Chemical substances may harm the human body in three ways by directly burning the skin or eyes by irritating the skin so that dermatitis is produced and by entering the body and causing rapid or slow poisoning

Almost all chemical substances can cause trouble if misused If used with understanding *and proper care however they can be handled with complete safety* In this type of work in particular prevention is better than cure and in planning prevention management and workers must co operate fully This applies with equal force to measures for early and prompt treatment

Chemical Burns

Chemical burns may be caused by acids or alkalis In either case speedy treatment is vital The acid or alkali must be washed off *at once* or at least greatly diluted by flooding the affected part with large volumes of water Thus if no special antidotes are available a chemical splash in the eye should be treated by holding the eye open under a running cold tap or by plunging the upper part of the face into a bucket of cold water and blinking hard Similarly an acid or alkali splash on the skin should immediately be held under a running tap

To lay people the word antidote has an almost magical significance Hence there is always the danger that with chemical burns precious minutes may be lost hunting for an antidote when speedy treatment with water will do far more good The best antidote of all is plenty of water applied quickly Only after this has been done should time be given to finding and applying the correct chemical antidote unless of course a large volume of antidote is immediately at hand

Acids

Acids may be quick acting or slow acting The chief risks come from filling transporting and emptying carboys and from accidental spilling and splashing Those without technical training for example cleaners in laboratories run special risks and should be carefully instructed in the necessary precautions

Quick acting Acids

With quick acting acids the patient feels irritation and burning almost at once *Hydrochloric acid* is used in pickling vats metal wire drawing the manufacture of other acids etc It produces a dark brown blister which later turns black

Tar Burns

Burns caused by tar should be covered with a dry dressing and the patient referred to a trained nurse or doctor Solidified tar is itself a good dressing so no attempt should be made to remove it

Chemical Injuries to the Eye

Eye injuries are dealt with initially in much the same way as chemical injuries to the skin using water and buffered phosphate solution They will be considered in detail later

Chemical Skin Irritation

Dermatitis or inflammation of the skin is of great importance in industry Almost any chemical substance can produce dermatitis in a person whose skin is sensitive yet others can handle the same substances with complete impunity An extreme example is dermatitis produced by water in some washerwomen A strongly alka line soap may also produce dermatitis Some substances are particularly liable to cause trouble for example acids and alkalis solvents and degreasers detergents oils and tars glues synthetic resins plasticisers and accelerators metallic irritants such as mercury and arsenic nickel and cyanide and sugar flour and certain woods

At the same time it must be remembered that many skin complaints are not caused by occupation or chemical irritation of the skin These non industrial skin complaints are equally liable to lead to absence from work if neglected They do not of course entitle the sufferer to industrial injury benefit

The first aider should never attempt to deal with a case of industrial dermatitis or indeed any other skin condition His job is to encourage treatment by an expert at the earliest possible stage Delay makes treatment far more difficult and exposes others to the same risk

Here again prevention is a matter for the factory management and the doctor and it must be individually planned wherever there is a real risk It involves the proper planning of the job the personal cleanliness of the worker and the use of a carefully selected barrier cream or other physical protection Hence the proper hygiene of wash places and lavatories and the changing and cleaning of protective clothing are of great importance The first aider may have special duties here He may also help by directing the attention of the factory authorities to any possible hazard or risk Remember that the most important single way of preventing indus trial dermatitis is personal cleanliness

Industrial dermatitis is not a notifiable industrial disease in the legal sense (see below) But the sufferer is entitled to cash benefit at the industrial injury rate

Chemical Poisons

Chemical substances may enter the body through the skin the lungs or through the stomach and digestive system The subject of industrial poisoning is a vast one most of it being outside the range of the first aid worker He must however know how to deal with such emergencies as may arise and be aware of the existence of certain possibilities

possible If not immediately possible the affected area of clothing should be flooded with water or antidote If in doubt swill everywhere

5 Slow acting acids should be dealt with as above but special treatment by a trained nurse or doctor will be needed to neutralise any acid which has penetrated into the tissues For example calcium gluconate may have to be injected under a hydrofluoric acid burn

6 It follows that every suspected case of a slow acting acid burn should be seen by a trained nurse or doctor as soon as possible after initial first aid treatment With quick acting acids the same applies if after initial treatment the skin shows any change or the patient feels any adverse effects or if the quantity of acid involved was at all considerable

Prevention

The prevention of chemical burns is a matter for the management as a whole often in consultation with the factory medical officer This will include the provision of first aid facilities at all danger points These will be described later when eye injuries are dealt with The factory medical officer must make sure that the workers and first-aiders directly concerned know how to use these facilities

Alkalis

Generally speaking alkali burns are more serious than acid burns because the alkalis tend to penetrate quickly into the tissues and to go on acting even after thorough washing and neutralisation Thus alkalis closely resemble the more dangerous slow acting acids An alkali burn is therefore usually worse than it appears at first Once the alkali has penetrated the skin appears pallid and sodden and later a deep slow healing ulcer may develop

The main alkalis used in industry are caustic soda caustic potash ammonia bleaching powder lime and cement They are used in a wide variety of chemical processes including the making of soap paper dyes and detergents as well as for cleaning wool barrels and enamel and in the building industry

Treatment of Alkali Splashes

First aid treatment is exactly the same as for acids with the first emphasis on speedy complete washing with a large volume of water this may be followed by buffered phosphate solution If the solution is available in a large quantity it may be used instead of water from the start

Some first aid books suggest that if no buffered phosphate solution is at hand dilute vinegar (two tablespoonfuls to a pint of water) or citric acid tablets dissolved in water may be used but these are unlikely to be available in a factory in any event they add little to the benefit of the water douche

With lime bleaching powder or cement solid particles should be removed from the skin *before* the part is flooded with water as water makes them stick Removal is best done with a piece of cotton wool or a soft brush

All alkali injuries should be seen by a trained nurse or doctor at the earliest possible moment The provision of first aid facilities at danger points is even more important with alkalis than with acids

Chapter 10

Unconsciousness, Gassing and Asphyxia

The first aider who is faced with a patient who has been found or has become unconscious is not called on to make a diagnosis He must however make an immediate assessment of what has happened

Ascertaining the Cause

There are three kinds of situation – (1) where the cause is obvious (2) where it is probable and (3) where the first aider can see no obvious cause It is vitally import ant to make this assessment since the first step in first aid is to remove the unconscious person from danger and this can be done only after a broad decision about the probable cause has been made

Where the Cause is Obvious

Some circumstances in which the patient is found show fairly clearly what has happened – for example where unconsciousness is due to partial drowning electric shock head injuries or attempted suicide

The patient who has attempted suicide may be found hanging or with his head in a gas oven and a pillow under the head or in bed with an open bottle of tablets beside him In these circumstances the first aider must not try to be an amateur detective His job is to waste no time and save life if he can

Where the Cause is Probable

In a situation where the cause of unconsciousness is probable we are concerned almost entirely with accidental gassing wh ther domestic or industrial Domestic gassing may occur in a bathroom owing to a defective geyser or in a bedroom *owing to a gas fire blowing out when the patient is asleep* Gassing in industry may have many different causes The first aider should know of the existence of risks in any particular processes in his factory

Some common industrial processes always have a certain risk Thus flues and boilers may develop defects causing gas or exhaust to blow back into the stoke hole this may result in asphyxia or unconsciousness Similarly workers in deep hol s and mines are subject to special risks

No Obvious Outside Cause

As a rule the first aider will not be able to make an accurate diagnosis in cases

The direct action of chemicals on the skin has been dealt with above But certain chemicals for example chrome and nickel may produce ulcers in the skin or in the membrane lining the nose Such ulcers are known as trade holes Fortunately these are now extremely rare Certain other chemicals can penetrate the skin without damaging it In consequence they have to be handled with great care and circumspection in these cases safeguards are laid down by law

Gases fumes and dusts are important hazards in certain industries They will be dealt with in detail later Many dusts though unpleasant are not poisonous But dusts containing particles of silica of a certain size are liable over the years to produce severe lung damage These risks are now well appreciated and preventive measures are general Nevertheless laxity on the part of those involved may break the preventive chain here the first aider can help both by example and precept

Chemicals entering via the mouth stomach and digestive system are of comparatively small importance in industry Very rarely are there suicides and accidents More important dirty hands may contaminate food This emphasises the importance of washing the hands before food is eaten and where chemical processes are involved of not eating on the factory floor

Notifiable Industrial Diseases

As a result of the Factories Acts and the work of the factory inspectors the well known industrial poisons have been very largely brought under control These poisons mainly cause symptoms of very slow onset and are therefore seldom seen by the industrial first aider

Fourteen different industrial diseases and conditions are notifiable by doctors and employers to the factory inspectorate of the Ministry of Labour These are

Poisoning by	lead phosphorus manganese arsenic	mercury carbon bisulphide aniline benzene
Anthrax Compressed air illness (caisson disease) Toxic jaundice		Toxic anaemia Chemical skin cancer Ulceration due to chromium

If a first aider suspects either a process or an illness he should let his factory management know at once The matter can then be investigated and the Ministry of Labour appointed factory doctor informed if there is a *prima facie* case for doing so

Under the Industrial Injuries Act a much longer list of diseases is included A sufferer from any of these or from an industrial injury is entitled to cash sickness benefit at the special industrial injury rate The patient himself has to make the necessary claim by filling in Part III B of the ordinary First Medical Certificate issued by the patient s own general practitioner This certificate is then sent by the patient to the local Ministry of Pensions and National Insurance office An additional fourteen chemical substances besides those which cause notifiable diseases and a number of processes are covered Full particulars are given in a free Ministry of Pensions and National Insurance leaflet *Prescribed Industrial Diseases* (N I 2)

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where there is no obvious external cause though he may have his suspicions It will help him to remember that there are six common causes which cover most cases of this type fainting fits, strokes diabetes alcohol and hysteria These are referred to below

Care of Unconscious Patients

Once the patient has been removed from external danger there are certain general lines of care whatever the cause of unconsciousness which must always be followed

1 Remove the unconscious person from danger If he is *not* in danger do not attempt to move him

2 Roll the patient over into the prone or semi prone position An unconscious patient may suffocate if left lying on his back The tongue falls back into the throat and may block the entry to the windpipe so also may badly fitting false teeth In addition saliva or vomited material may be breathed into the lungs with very serious results Often the unconscious patient is seen to be choking struggling for breath and turning blue This may be due almost entirely to obstruction of the air passages as a consequence of lying on the back

Many lives have been lost because patients have not been turned over into the prone or semi prone position *Prone* means face downwards and the elbows bent so that the forearms and hands are under the forehead (*Fig* 42) *Semi prone* means that the patient s body is on its side his face turned towards the ground To stop the body rolling right over both arms should be bent naturally at the elbows and the upper leg bent slightly at the hip and knee so that it falls forward over the lower leg and acts as a supporting strut (*Fig* 43) If there is retching or vomiting the semi prone position is to be preferred as the mouth and nose are more easily kept clear

Before rolling the patient over make sure that no obvious fractures are present If they are roll the patient over but support the fractured part Rolling should be done firmly but gently moving the whole body into what looks like a natural and easy position

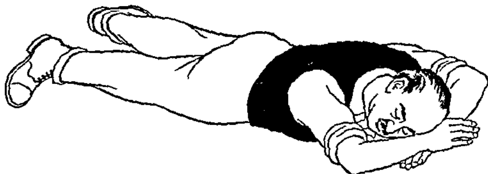


FIG 42 *The prone position Note the forehead resting on the forearms and hands and the face turned very slightly to one side*

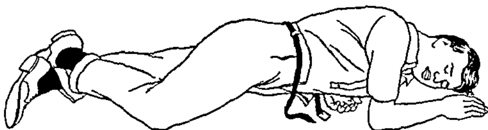


FIG 43 *The semi prone position Because the patient is uncon scious the collar and trousers have been loosened*

3 Remove any false teeth It is important to do this gently so as not to damage either the patient or the teeth The teeth should be wrapped in the patient s own handkerchief and put in his pocket If the jaw is tightly closed do not try to force it open

4 Raise the point of the chin with the hand so that the neck is bent slightly back This helps to open up the air passage at the back of the mouth Try it on yourself by dropping your chin on to your chest and then lifting it well up the difference in ease of breathing is immediately felt.

5 Loosen any tight clothing especially round the neck or waist

6 If the patient has *to be moved* he should be lifted carefully on to a stretcher still in the prone or semi prone position and carried in this way Details will be given later

Some Don ts

(i) Do not force fluid (whisky brandy or anything else) into an unconscious patient s mouth He cannot swallow and will probably inhale it and may get pneu monia

(ii) Don t slap or throw water over him

(iii) Don t try to transport him sitting up He must be moved lying down in the prone or semi prone position Attempts to sit up an unconscious person for example *in* the back of a car have proved fatal

Internal Causes of Unconsciousness

Mention has already been made of *internal causes of unconsciousness* Here the general principles for the care of the unconscious patient set out above apply with full force

Fainting has been discussed earlier The sufferer is usually a young person and the situation is often suggestive The unconsciousness is always of short duration

Fits are alarming but are usually quickly over They are almost always due to the condition of epilepsy and the patient will often have had previous attacks Happily as a result of the new drugs used to control them epileptic fits are much *rarer* than they used to be but they may occur if the patient forgets to take his tablets or to bring them with him to work

As a rule at the start of the fit the person utters a cry and then falls over The

limbs stiffen and then start to jerk The patient may froth at the mouth bite the *tongue* pass urine or pass a motion *All the time he is quite unconscious* and when the violent phase is over he falls into what appears to be a deep sleep This usually lasts only a short time He may hurt himself in falling

Never restrain the patient violently This simply makes the fit worse The secret of good first aid is to prevent the patient harming himself Pillows coats and other soft objects placed around him are safer and more effective than human strength Never force the jaws apart in order to prevent tongue biting it is possible to knock out teeth and fracture the jaw If the mouth is open it is reasonable and safe to put in a gag This is no more than a wedge to keep the jaws apart One such wedge is a piece of firewood with a clean handkerchief wrapped round it Another is a stout pencil not less than 5 inches long (*Fig* 44) Never tell an epileptic patient what his fit is like as he may be quite unnecessarily distressed Unconsciousness during the fit is one natural blessing of the disease

Strokes are caused by a bursting artery or a blood-clot in the brain Though a stroke is sometimes fatal many patients recover Good first aid care as already described above may save life

The patient is usually elderly He may feel giddy and may or may not pass out completely As a result of the injury to the brain he usually loses the ability to move one side of the body wholly or in part This involves most obviously the arm



FIG 44 *A stout pencil used as a gag to prevent tongue biting in an epileptic fit Note that the eye balls are rotated upwards so that the pupils are almost out of sight*

or leg At the same time the other side of the face is also paralysed In an unconscious patient who has had a stroke the paralysed cheek may be seen flapping in and out each time the patient breathes

The fact that the patient has had a stroke is suggested by his age – he is usually in his 50s or 60s the colour of his skin which is usually blue loud harsh breathing called stertorous breathing the flapping cheek and dribbling from the corner of the mouth Treatment is generally as set out above Of course the first aider must s nd for skilled help without delay

Diabetes People may conceal the fact that they are diabetics from their work mates and from the factory management sometimes with disastrous results It is in their own interest that their condition should be known about at any rate to the management or the factory medical department No one need be ashamed of suffering from diabetes since the discovery of insulin the world has been full of diabetics leading useful and happy lives often doing first class jobs

The most usual cause of trouble in a diabetic is over action of a normal dose of insulin as a result of physical fatigue excessive work or worry or missing a meal The patient may become giddy confused and even apparently mentally disordered The treatment is to give sugar at once preferably in the form of a sweet drink Skilled help should be sent for

Alcohol It must never be assumed that an unconscious patient who smells of alcohol is therefore drunk People who feel giddy often take a drink before passing out Tragedies can occur when an unconscious patient smelling of alcohol is handed over to the police The proper course for the first aider is to send for expert nursing or medical help

Hysteria The first aider should never assume that an unconscious patient is hysterical Indeed hysteria hardly ever causes complete unconsciousness

Occasionally however a patient usually a young girl but sometimes an older woman or a man will become typically hysterical The situation is usually one of danger or anxiety such as a man made or natural disaster Hysterical bad behaviour like screaming or violent weeping may lead to panic In such circumstances and in such circumstances only firm physical measures are justified to prevent panic from breaking out

More occasionally still hysterical behaviour can follow serious injury to or disease of the brain In these cases it appears to be caused by lack of oxygen to the brain tissue This is another reason why hysteria other than the hysteria of panic should be treated with gentle but firm kindness rather than the traditional slap

Rescuing a Gas Casualty

As gas casualties are of considerable industrial importance first aiders in factories where there are substantial hazards should be fully trained and practised in rescue work The following are the general principles to be observed

1 Before entering a gas filled room or house open or if necessary smash doors and windows so as to get a through or cross draught This will blow gas or fumes away The first aider must be careful not to add himself to the casualty list Courage is no substitute for using one s head

2 Remember that a damp cloth or towel tied round the face gives *no* protection against gas

3 If two or more people are present one should stay outside in case the rescuer himself needs rescuing A life line tied round the rescuer s waist should always be used It is simply a rope strong enough to pull a man along the ground

4 If the rescue worker has to make a dash into a gas laden atmosphere he should take slowly six really deep breaths then hold his breath and dash in He will be able to hold his breath for three quarters of a minute to one minute at the most

5 In gas-filled places the light is often poor Some gases for example carbon monoxide and methane are inflammable The first aider engaged in rescuing a gas casualty should *never* use a naked flame

6 Respirators should not be used by the inexperienced or untrained first aider Rescues which require their use also call for an experienced rescue worker The proper use of respirators requires a good deal of practice The first aider who puts one on for the first time in a real action situation may easily panic

Types of Respirator

Details about the use of the different types of respirator are set out in the instructions issued by the makers of each type and in the St John Ambulance Association occupational first aid handbook

Filter Respirator

The filter respirator is essentially the ordinary civilian or service gas mask The canister and filter must be in good order Protection is only against certain special gases Industrial filter type gas masks have coloured canisters for different gases – for example blue for ammonia and black for bromine chlorine and hydrogen sulphide A respirator of this type gives no protection at all against carbon monoxide or coal gas

Flexible hose Respirator

Attached to the face piece is a long flexible tube the intake end of which must be fixed in good fresh air The tube may be up to 120 feet long and care must be taken to avoid its kinking There should always be a second man to make sure that the tube is clear all the way Such tubes are commonly supplied for cleaning out tanks – for example trichlorethylene de greasing tanks When in use a lifeline should be employed as well

Oxygen cylinder Respirator

The oxygen-cylinder type of respirator is made for an open or a closed circuit With an open circuit the air breathed out from the lungs escapes with a closed circuit it passes through a cylinder which absorbs the co The air can then be used again It fol lows that with a closed circuit re breathing machine of this type the available oxygen lasts much longer

Respirator with Compressed air Cylinder

The respirator with a compressed air cylinder is of the open circuit type and there is no re breathing With a typical cylinder (1 200 litre) the rescue worker can do 25 minutes hard work or 75 minutes light work

The mask of a respirator may cover the whole face or the nose and mouth or the mouth only With a mouth only mask a nose clip is required as well With a nose and mouth or a mouth only mask goggles may be needed to protect the eyes

Industrial Gases

There are four types of gas encountered in industry irritant gases asphyxiating or smothering gases tissue poisoning gases and narcotising gases

Irritant Gases

Irritant gases are immediately detected by their effects particularly on the nose and eyes The smell is powerful and the eyes start to water As a rule those exposed fly for their lives Hence these gases are less dangerous than those which are non irritant The common irritant gases met with in industry are as follows

Sulphur dioxide (SO_2) is used in the manufacture of sulphuric acid and in fumigation and refrigeration it also occurs in ordinary smoke

Ammonia (NH_3) is employed in refrigeration and ice making and a number of other industrial processes

Chlorine (Cl_2) is used in bleaching paper making etc

Phosgene ($COCl_2$) mainly of importance as a war gas is produced during the manufacture of some aniline dyes It is also produced when trichlorethylene is inhaled through a lighted cigarette hence the instruction that those using trichlorethylene should not smoke at work

Simple Asphyxiating Gases

The air we breathe consists of about four fifths nitrogen and one fifth oxygen The nitrogen is inert the oxygen is absorbed by the blood and carried throughout the body to enable the tissues to live without oxygen the tissues die Asphyxiating gases work simply by replacing the oxygen in the air It follows that they must be present in very large quantities to get rid of enough oxygen to do harm Most of them have no smell this makes them the more dangerous The following are the common asphyxiating or smothering gases met with in industry

Nitrogen (N_2) is important for practical purposes only in wells mines and other deep holes where all the oxygen has been used up Absence of oxygen is shown when a safety lamp flame lowered into the hole goes out In mines nitrogen with some carbon dioxide is spoken of as black damp or choke damp

Methane (CH_4) is the gas most commonly met with in mines where it is called fire damp because it explodes if ignited

Carbon dioxide (CO_2) is produced by the living tissues of the body as a waste product and breathed out by the lungs Large quantities are produced in brewing aerating and fermenting It may also be met with in mines tunnels cellars and boilers In *mines* as mentioned above it is a constituent of black damp

Tissue poisoning Gases

Small quantities of tissue poisoning gases exert a disproportionate poisonous effect They are absorbed quickly into the blood from the lungs (or even from the mouth) and equally quickly they poison the living tissues by preventing their intake of oxygen The common gases under this heading are set out overleaf

Black damp is about 87 per cent nitrogen and 13 per cent carbon dioxide

Carbon monoxide (CO) is perhaps the most important industrial gas poison A constituent of coal gas it is also produced when coke coal or petrol is burnt In consequence a blocked flue which causes the products of combustion to leak out into a workplace may produce carbon monoxide poisoning The same result may be brought about by a petrol engine working in a closed space Carbon monoxide may also be met with in tunnels and at gas works and in coal mines where it is called after damp because it follows explosions Ordinary coal gas contains 5 per cent carbon monoxide exhaust from a petrol engine 7 per cent carbon monoxide and producer gas 25 per cent

Hydrogen sulphide or sulphuretted hydrogen (H_2S) is evolved in glue making and tanning and may occur in mines In small concentrations it is violently irritating and has a foul smell in large concentrations a man inhaling it may drop down dead Because of its foul smell it is called stink damp

Hydrogen cyanide (HCN) is so poisonous that it is usually employed only in the open air Sometimes however it is used for fumigation of premises or dirty fabrics It has a smell of bitter almonds and is almost instantly fatal Wherever it is used the makers precaution card should be exhibited and antidotes should be immediately available

Cyanides (liquids not gases) are equally poisonous if taken by mouth Although they are widely used in industry for case hardening and electro plating casualties from their employment appear to be almost unknown

Narcotising Gases

Narcotising gases produce anaesthesia or unconsciousness when inhaled by acting directly on the brain They are in fact the anaesthetics so widely used in medicine Any anaesthetic if pushed too far will ultimately prove fatal Some industrial solvents are anaesthetics – for example ether and chloroform

The most common anaesthetic used in industry is *trichlorethylene* employed in degreasing Workers with trichlorethylene tanks must be especially instructed in the precautions needed to avoid gassing The makers placard should be exhibited and read

Another even more dangerous substance is *carbon tetrachloride* used as a solvent a dry cleaner and a fire extinguisher The vapour may cause sudden unconsciousness or in small quantities stomach upset and abdominal pain If rendered unconscious by carbon tetrachloride the patient should not be placed on the floor of the room where the accident has occurred as the vapour is five times heavier than air and therefore accumulates on the floor

Symptoms of Gassing

The symptoms produced by gassing depend on the nature of the gas the amount inhaled and the length of exposure With the irritant gases coughing and watering of the eyes and nose are immediately apparent With the tissue poisoning or narcotising gases the patient quickly becomes unconscious but may retain a good colour With the simple asphyxiating gases there are usually two stages

1 Partial asphyxia The patient feels dizzy and weak and may stagger and collapse There may be difficulty in breathing with panting and gasping Occasionally there are convulsions especially as the patient breathes out

2 Full asphyxia The patient is unconscious and blue especially at the tips of the body – the nose ears lips and fingers Breathing is first intermittent and then absent. The pulse is first weak and then absent The absent pulse does not necessarily mean however that the heart has stopped

Treatment of Gassing

The treatment of gassing may be briefly summarised removal from danger artificial respiration if breathing has ceased administration of oxygen treatment of shock and general care of the unconscious patient as set out above

Dusts and Fumes

Many industrial dusts are harmless even if unpleasant Some produce mild symptoms A few are truly dangerous

One of the slowly dangerous dusts is that from cotton fibre in textile mills This produces a mild form of bronchitis called byssinosis Exposure over many years may produce more serious results

The most dangerous dusts are those containing silica in the form of silicon dioxide * This acts on the lungs to produce a hardening of the tissues which over the years is first disabling and may ultimately prove fatal The condition is called silicosis Common sources of silica are hard anthracite coals flint chippings and certain grinding processes Asbestos is another dangerous source it is inert in its final form but may cause trouble during manufacture

When melted certain metals give off fumes which may be dangerous to health Hence the need for efficient extraction apparatus in foundries

Dust and fume suppression and control is a matter for the management but the first aider can assist by example and precept in seeing that the workers concerned take the necessary precautions even though these may be irksome This applies particularly to the use of filter containing masks on dangerous processes

D g a ses only wh e th re a mo th n 5 m ll n p rt l of 1 o d de pe cub c foot f d whe e th p rt les a e betwee ½ 10 m ro e

Chapter 11

Artificial Respiration

Artificial respiration or artificial breathing is required *when breathing has stopped but life is not extinct* Patients who need artificial respiration are always unconscious but most unconscious patients have not stopped breathing so do not need artificial respiration *The most usual causes of cessation of breathing are* electric shock drowning carbon monoxide poisoning and pressure outside the chest from falls of earth or masonry and very rarely from a dense crowd of people

In such cases the time between the cessation of breathing and the stopping of the heart beat is short The purpose of artificial respiration is to give the heart and other tissues the oxygen they need to remove the unwanted carbon dioxide from the body and to encourage the lungs to start work again Clearly speed is vital Artificial respiration must be started on the spot unless the patient has to be moved out of obvious danger such as contaminated air

Methods of Artificial Respiration

Many ways of carrying out artificial respiration have been devised They may be considered under five main headings

" Push " Methods

In push methods the operator pushes on the outside of the chest to force air out relying on the natural recoil of the ribs to suck air in The classical push method is that of Schafer which was invariably taught to first aiders until a few years ago It has the advantage of simplicity but it produces only a small movement of the lungs and cannot be used if the ribs have been fractured

" Pull " Methods

In pull " methods the operator moves the arms so as to stretch and expand the chest thus causing an intake of air The best known pull " method is that of Silvester although in this there is a small element of pushing as well

" Push and pull " Methods

Both the above methods are combined in push and pull methods The push and pull " method devised by Lieut Col Holger Nielsen of the Danish Army is now taught to first aiders the world over It is almost certainly the most effective of the simple manual methods and is the method chosen for full description here In first aid it is always best to have a clear and simple plan of action So in training to carry out artificial respiration it is better *to know one method properly than to have confused ideas of* several Descriptions of the other manual methods are therefore omitted

" Rocking " Methods

In rocking methods the principle is to use the diaphragm (the partition between

the chest and the abdomen) and the contents of the abdomen as a piston first to compress and then to inflate the lungs This is more efficient than any of the manual methods but it requires special apparatus It is possible to improvise a rocking stretcher but this is not without danger In a fully equipped industrial medical department or industrial health service a proper rocking stretcher should be available

"Suck-and Blow" Methods

The lungs may be expanded and contracted in a natural way by applying first a positive pressure then a negative pressure either outside the walls of the chest or directly down the wind pipe

An outside pressure can be applied only with an elaborate mechanical apparatus the iron lung It will never be available in first aid It is however of great value in hospital when the patient s breathing muscles have been temporarily paralysed by a disease such as poliomyelitis

Direct inflation and deflation of the lungs by air or oxygen is achieved by alternately blowing and sucking through the nose and mouth and the air passages Provided there is a clear air way such a method is completely effective It is used by all modern anaes thetists during operations when chest and other muscles have been temporarily paralysed by special drugs For first aiders there are two possible suck and blow methods

Mouth to mouth was the method used by Elisha * It has recently been revived by Dr Peter Safar in America Unfortunately it is very hard to teach to first aiders indeed the only practical teaching method is to use an expensive human dummy † The operator has to blow hard into the mouth of the patient making sure that the patient s chin is well up the mouth open the tongue out of the way the nostrils closed and above all that there is a good fit of lips to lips The method is undoubtedly very effective but for the present its teaching is impracticable

Stephenson s Minuteman Resuscitator† produces positive and negative pressure through a face mask using no elaborate pumps or moving machinery The power comes from the pressure of oxygen in an ordinary oxygen cylinder Its full use is described in the manu facturer s booklet properly employed it is the most efficient means of artificial respira tion available to the first aider We advocate its installation in industry wherever there is a substantial risk of electric shock or asphyxia from other causes Where a Stephenson Minuteman is available first aiders must receive special training in its use

Only two methods of artificial respiration will be described in detail – the Holger Nielson Method and the Rocking Stretcher Method If the first aider is able to carry out these efficiently he can do all that is generally required of him

Preparation for Artificial Respiration

Before starting artificial respiration the following steps should be taken as quickly as possible

1 Roll the patient into the prone position

2 Put the finger inside the mouth and sweep it around to remove any obstruc tion – for example sea or pond weed or false teeth

3 Make sure that the tongue is hanging in its normal forward position

4 Loosen the collar

5 Remove any lumps in the clothing from the front of the chest – for example a tin in a pocket Such an object may damage the ribs when artificial respiration is started

6 If the patient has been submerged or has been vomiting the first aider should stand astride the patient clasp the hands underneath his stomach and raise him

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† Made in B t n by B t h O ygen Ga es Ltd Great West Road B e tford M ddles

quickly a short distance from the ground Repeat twice This helps to empty the air passages

Do not waste any time in removing wet clothing

The steps referred to above should not take more than a minute or so Artificial respiration should then be started immediately Meanwhile an assistant should send for a doctor and an ambulance and make arrangements for a rocking stretcher or a Stephenson Minuteman Resuscitator if these are available

Artificial respiration should be continued rhythmically without stopping until natural breathing starts again or until the doctor pronounces the patient to be dead Remember that patients have sometimes been revived after as long as an hour or more When the patient begins to breathe on his own the timing must be adjusted to fit in with his breathing From then on the patient sets the rhythm and the first aider has to help the patient s own chest movements Once he is breathing properly he should be well covered and left lying quietly in the prone position until removed by ambulance to hospital

The Holger Nielsen Method

The Holger Nielsen method is also known as the back pressure arm lift method a good descriptive title

Position The patient must be placed in the *prone* position with the elbows bent and projecting out sideways and the hands crossed under the head The head will be turned slightly on one side so that the cheek rests on the hands The nose and mouth must be clear of any obstruction

The operator kneels on one knee at the head of the patient and facing him The knee is placed in the angle between the patient s head and his forearm The opposite foot is placed near the patient s other elbow (*Fig* 45) Alternatively the

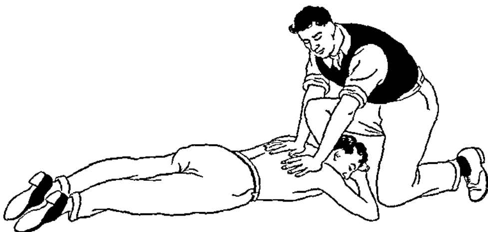


FIG 45 *Holger Nielsen method of artificial respiration position of operator and patient at the* start of the cycle *Note the patient s head turned slightly to one side with the cheek resting on the hands the operator s knee is in the angle between the patient's head and forearm the operator's arms are straight inclined at an angle to the patient's back*

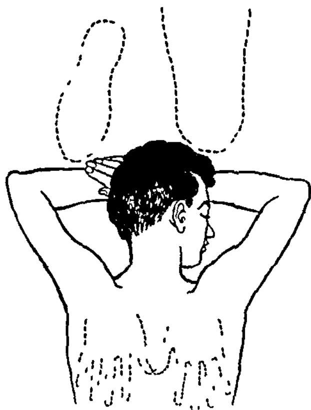


Fig 46 *Holger Nielsen method position of the operator s hands on the patient s back Note that the tips of the thumbs are just touching and the wrists on a level with the patient's armpits*

operator may kneel on both knees one on either side of the head If the one knee position is used he will find it an advantage to change the knee from time to time

The operator places his hands on the flat of the patient s back The tips of the thumbs should be just touching with the fingers pointing downwards and outwards and the wrists on a level with the armpits (*Fig* 46)

In making the movements the operator s arms should be kept straight and the body weight used to produce the effects All the movements should be made steadily slowly and rhythmically the operator counting out loud slowly as he proceeds

Movements

The sequence of movements is best looked at first in tabular form

Movement	*Time*	*Count*
First movement		
Compression of patient s chest	2 seconds	One two
Second movement		
Slide hands to patient s elbows	1 second	Three
Third movement		
Raise patient s elbows	2 seconds	Four five
Fourth movement		
Lower elbows and slide hands to patient s back	1 second	" Six

Compression of the patient s chest produces breathing out or expiration Raising the patient s elbows produces breathing in or inspiration The effect of the cycle of movements on the patient is as follows

Breathing out	2 seconds
Relaxation	1 second
Breathing in	2 seconds
Relaxation	1 second

The full cycle takes six seconds giving a rate of artificial breathing of ten to the minute

The movements will now be described in detail

First Movement

The aim of the first movement is to force air out of the patient s chest that is to produce artificial expiration

The operator rocks slowly forward until his arms are vertical and the weight of the upper part of his body is pressing steadily down on to the patient s chest through his hands He counts slowly out loud One two (*Fig* 47)

It is important to exert the pressure on the patient s chest by the rocking move ment and the weight of the body and not by bending the elbows and pushing

Second Movement

The pressure on the chest wall is relaxed and operator rocks slowly backwards sliding his hands up the patient s arms to just below his elbows He counts out loud Three (*Fig* 48)

Third Movement

The aim of the third movement is to stretch the chest so as to draw in air thus

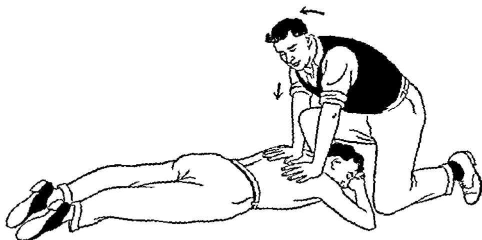


Fig 47 *Holger Nielsen method* first movement *compression of the chest producing artificial expiration (breathing out) The operator has rocked forward so that the arms are vertical the elbows being kept straight The weight of the operator s body is pressing steadily down on the chest*

producing artificial inspiration The elbows and arms are drawn up off the floor towards the operator He counts out loud Four five (*Fig* 49)

In making this movement it is important not to drag the patient s body forward towards the operator this tends to bend up the neck and block the air way

Fourth Movement

The patient s arms are dropped gently to the ground and the operator s hands are slid down the arms and back to their starting position on the chest. The operator counts out loud Six (*Fig* 45)

General Points

How hard should the operator press on the chest? This must vary with the build and size of the subject. For a large male pressures of 30 lb may be exerted for a small female 12 lb and proportionately less for a child To estimate these pressures try pressing on a bathroom spring weighing machine A strong man must be careful not to do damage by pressing too hard on a small subject

When breathing starts the arm raising and lowering only should be carried out, keeping carefully in time with the breathing Count one two three for inspiration when the arms are raised and four five six for expiration when the arms are lowered

If there are chest injuries the first movement of pressing on the chest should be omitted and arm raising and lowering only should be carried out. If there are arm injuries the arms should be laid by the sides The chest pressure movement should be carried out but in place of the arm and elbow raising the points of the shoulders should be lifted from underneath If there are chest injuries and arm injuries shoulder raising only should be carried out

Eve s Rocking stretcher Method

As mentioned above the principle of the Eve s rocking stretcher is to use the

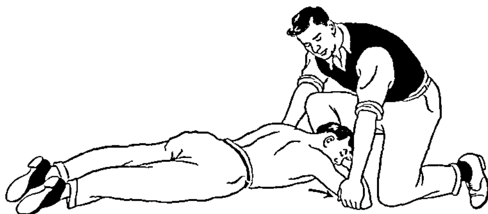


FIG 48 *Holger Nielsen method* second movement *The operator has rocked backwards sliding his hands and arms (still straight) along the patient's arms to the elbows The release of pressure on the chest has already started the process of inspiration (breathing in)*

Compression of the patient s chest produces breathing out or expiration Raising the patient s elbows produces breathing in or inspiration The effect of the cycle of movements on the patient is as follows

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Relaxation	1 second
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It is important to exert the pressure on the patient s chest by the rocking movement and the weight of the body and not by bending the elbows and pushing

Second Movement

The pressure on the chest wall is relaxed and operator rocks slowly backwards sliding his hands up the patient s arms to just below his elbows He counts out loud " Three (*Fig* 48)

Third Movement

The aim of the third movement is to stretch the chest so as to draw in air thus

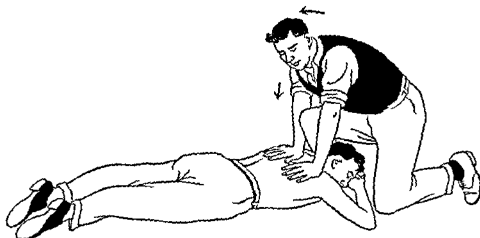


Fig 47 *Holger Nielsen method* first movement *compression of the chest producing artificial expiration (breathing out) The operator has rocked forward so that the arms are vertical the elbows being kept straight The weight of the operator s body is pressing steadily down on the chest*

FIG 50 (left) *Riley rocking stretcher for Eve's rocking stretcher method of artificial respiration* FIG 51 (right) *Riley rocking stretcher method of strapping patient Note the adjustable harness and foot rest The hands are under the patient with the fingers out straight well out of the way of the moving parts*



Fig 49 *Holger Nielsen method* third movement *The operator has raised the patient's elbows and arms and drawn them slightly towards him But he has not raised the patient's head from his hands or the hands from the ground Throughout the cycle note the way the operator's head moves back and forth above the patient*

diaphragm and the abdominal contents as a piston The patient is fixed to a stretcher which can rock on an axis exactly like a see saw When the patient's head is up the abdominal contents fall down towards the feet and thereby suck air into the lungs and vice versa In the United States and in this country children with poliomyelitis affecting the breathing muscles may be nursed continuously on rocking beds using precisely the same principle

An improvised Eve's method is possible using an ordinary stretcher over a trestle The patient must be tied to the stretcher by the wrists and ankles but even so there is considerable risk of an accident. It is far more satisfactory to use a specially constructed rocking stretcher (*Fig* 50)

The Riley model* folds flat and is quite rigid and firm when erected In setting up the stretcher beware of pinching the fingers Simple straps and harness hold the patient firmly and safely in position A mercury indicator is embodied in one handle to show when the head should be raised or lowered As soon as all the mercury has run through a hole in the indicator the position of the stretcher is reversed Thus the indicator works on the hour glass principle

The rocking stretcher should be brought to the scene of operations without delay and erected The patient will be quickly lifted from the floor on to the stretcher the head rest and foot rest adjusted and the patient strapped on in the prone position (*Fig* 51) Until the moment the patient is placed on the stretcher artificial respiration by the Holger Nielsen method will have been in progress. The fixing of the patient to the stretcher should take under half a minute

* Made by Siebe Gorman & Co Ltd Davis Road Chessington Surrey

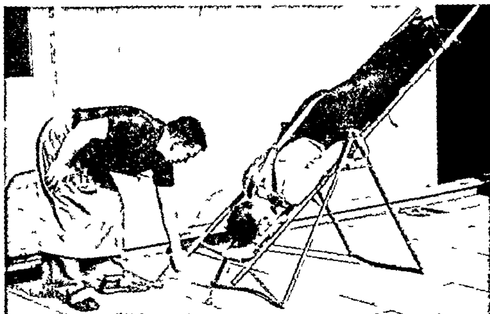


FIG 52 *Riley rocking stretcher in operation The operator is in such a position that he can observe the mercury indicator*

FIG 53 *Giving oxygen to a patient receiving artificial respiration on a Riley rocking stretcher A small oxygen resuscitation apparatus is in use the mask being strapped to the patient's face*

As soon as the patient is firmly fixed in position the tipping motion is started Thereafter one person can easily operate the stretcher for an hour or more without fatigue

The stretcher should be operated at the same rhythm as for artificial respiration by the Holger Nielsen method that is to say there should be about ten complete up-and down movements per minute (*Fig* 52) Care should be taken that the patient s hands are under his body with the fingers out straight and well within the confines of the stretcher otherwise they may be nipped in the trestle support Because of a similar risk the operator should keep his hands to the end of the stretcher

It is a good exercise for first aiders to experience the rocking stretcher in the position of the patient

Oxygen

If poss ble oxygen should be obtained and administered to the patient during artificial respiration whether this is carri d out by the Holger Nielsen or the rocking stretcher method (Fig 53)

Oxygen resuscitation apparatus consists of a cylinder containing compressed oxygen a main valve (often spanner operated) a control valve a pressure gauge a corrugated rubber or stiff plastic tube and a face mask Certain models embody a flow meter and a flexible rubber breathing bag In some the flow of oxygen to the mask is governed by the movements of the breathing bag and hence by the movements of the lungs In others the flow to the face mask is regulated by the control valve

As the details for operating each type of machine vary first aiders must study and master the manufacturer s instructions before use

In applying any type of face mask to a patient it is important that the chin should be raised up from the neck as much as possible so as to maintain a good air way The mask can be applied and the chin raised with one hand with the little finger under the chin The details of the method are best learnt by demonstration and practice

Chapter 12

The Eye in Industry

More than one in ten of all accidents in industry involve the eye by far the commonest of these is a foreign body in the eye In a typical metal working factory there were about 250 foreign bodies in the eye in the course of a year for every 1 000 workers employed It is therefore obvious that eye injury constitutes a most important part of the first aider s work

Most industrial eye casualties never reach hospital but are dealt with by first aiders industrial nurses industrial medical officers or general practitioners Nevertheless one third of all patients going to an eye hospital come from industry Half of these casualties are caused through working with an emery wheel When a foreign body comes away from the surface of the wheel it travels comparatively slowly and so does not penetrate too deeply into the eye It is usually composed of metallic dust abrasive and bonding material and is non magnetic Most of the other industrial eye casualties arriving at hospital come from turning milling spinning boring hammering and chipping

Examining the Eye

Any first aider who may be called upon to deal with a colleague s eye should know how to examine it This is best taught in a first aid class by each examining the eye of a fellow student in turn

1 The patient should be seated with a good light shining on his face and eye The first aider should stand behind the patient and support the head against his own body

2 The patient s head should be tipped well back and the eye then held open with two fingers (*Fig* 54) It will make it much easier to examine the bad eye if the patient is asked to keep both eyes open The patient should be made to look slowly and in turn at each of the four points of the compass so that the whole of the exposed eye may be carefully inspected There should be no hurry It is particularly important to inspect the front of the cornea (the transparent curved surface covering the pupil and iris)

3 If nothing can be seen the lower lid should be pulled away from the globe while at the same time the patient looks upwards This enables a foreign body under the lower lid to be seen It is possible to turn up the upper lid in such a way that its under surface can be seen but as this manoeuvre needs considerable experience if it is to be satisfactorily performed it is best not done by first aiders



FIG 54 (left) *Examining an eye The first aider stands behind the patient supporting the head against his own body The patient s head is tipped well back and the eye held open with two fingers of the left hand* FIG 55 (right) *Removal of a foreign body with a cotton wool applicator Note that the eye is held open with the left hand while the applicator is held in the right hand*

A foreign body may be seen on the front of the cornea on the white of the eye or on the red inside lid It may be black or glistening and may be fixed or moving

Removal of Foreign Body

A foreign body which moves will probably come out of the eye very easily Nature s method is to flush the eye with tears from the tear gland Flushing can be produced by getting the patient to blow his nose strongly and blinking several times On no account must the eye be rubbed

Should this fail the eye should be washed out with an eye bath using ordinary water The bath is completely filled and the eye lowered until in contact with it The bath is then raised and the patient must blink under water this is easier if both eyes are blinked at once If this fails to remove the foreign body then it is almost certainly stuck to the surface of the cornea Remember to wash and dry the eye bath after use before putting it away

The first aider who feels confident and has been properly instructed may make one attempt and one only to remove a foreign body which fails to come away with washing But if expert medical or nursing help is readily available it is better to pass the patient on for skilled attention

The attempt at removal should be made with clean cotton wool on an applicator (*Fig* 55) In the Harlow first aid box six of these are provided in an envelope When one has been used it should be thrown away immediately The eye should be held open and a single sweep with the cotton wool should be made over the foreign body If it is loose it will be seen attached to the tip of the cotton wool

The first aider should never use a matchstick or the corner of a handkerchief

Neither will be sufficiently clean to be safe A camel hair brush is also unsatisfactory because it is too soft moreover if not sterilised after use it will carry germs from eye to eye Unless the first aider is completely certain that a foreign body has been removed the patient should be referred to a nurse or doctor at once If the patient complains of any pain at all after removal th s also is an indication for referral In any case to make sure that the foreign body has gone the eye should be carefully inspected under a good light

A foreign body so well embedded in the surface of the cornea that it does not project may at first cause no pain There may be a latent period before the onset of pain of up to twelve hours or occasionally even longer Any patient who complains of pain and thinks that the foreign body entered at some earlier time should therefore be referred straight away to a nurse or doctor

If a foreign body has been in the eye for some time it may leave behind a small red ring of rust A nurse or doctor will remove this quite easily the following day after the foreign body has been dealt with It cannot be removed by a first aider

It is essential that the first aider should run no risks in dealing with eye injuries If there is the slightest doubt the patient should be sent to a nurse or doctor at once This applies with special force at night when there may be natural reluctance to call a doctor on duty Always cover the eye with a medium sized dressing or eye pad before referral

A doctor or sister can make use of a local anaesthetic on the eye so that both examination and treatment can be slowly and thoroughly carried out Oily cocaine eye drops used to be part of the official equipment in certain first aid boxes and they may still linger on in boxes which have not been restocked They should never be used by the first aider as in certain cases they are not without danger and make subsequent treatment far more difficult

The official 1960 first aid box regulations specify that all boxes must contain an approved eye ointment in a collapsible metal tube this is a 6 10 per cent sulphacetamide ointment It is not easy to apply ointment efficiently to the eye if the nozzle of the tube touches the eye it may transmit infection from eye to eye moreover in certain types of case application of an eye ointment may make subsequent treatment more difficult and indeed may do harm On balance we think the inclusion of this eye ointment is unwise and we recommend that it should never be used by the first aider

Small hand magnets are sometimes used by first aiders in practice these are virtually useless as almost all easily removed foreign bodies are non magnetic

Glass in the Eye

It may be very difficult to see glass in the eye Moreover a piece of glass is liable to cut the surface of the eye sometimes severely The first aider must on no account wash out the eye for fear of the washing fluid getting into the globe through the cut Nor must any drops ointment or liquid paraffin be put into the eye by the first aider liquid paraffin makes the glass slippery and its removal by an expert is much more difficult In fact the first aider should not attempt to remove glass from the eye The eye should be covered with a medium sized individual sterilised dressing and the patient sent for expert treatment as quickly as possible

Dust in the Eye

Dust may blow in through the open doorways of a factory or be blown up following the use of a compressed air hose for clearing debris The eye should be washed out, using water and an eye bath If the irritation is not speedily relieved the patient should be sent to a nurse or doctor in case there is a scratch of the cornea

Scratches of Front of Eye

The cornea or the conjunctiva (the membrane covering the white of the eye and the inside of the eye lids) may be scratched by a brush of the hand or some other object The patient often thinks there is a foreign body in the eye but on examination the first aider will usually be unable to see anything abnormal though there may be a good deal of watering Such cases should always be referred to the nurse or doctor for treatment as these scratches may otherwise become infected leading to the painful and much more dangerous condition of corneal ulcer

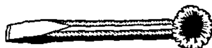


FIG 56 *Mushroom headed chisel with a badly worn head*

Foreign Bodies within Globe of Eye

A foreign body which penetrates the globe of the eye will not be visible when the eye is examined though a small cut in the cornea or the white of the eye may be seen Such an accident usually follows hammering or chipping with a mushroom headed chisel (*Fig* 56) particularly where the head of the chisel is badly worn A part of the head flies off at high speed and penetrates completely Any eye accident following the use of such a chisel must be assumed to be serious and should be sent for immediate treatment The eye should be covered with a medium sized individual sterilised dressing and the patient should be transported by car for preference lying down movement must be kept to a minimum for fear of starting bleeding within the eyeball In such a case it is dangerous to wash out the eye

If it is not swiftly diagnosed and treated the patient may lose the use of an eye

Conjunctivitis

Conjunctivitis is the state of inflammation of the membrane covering the front of the eye and the inner sides of the eyelids The patient feels a pricking or irritation in the eye and the eye itself appears red The condition may be caused by germs or dust but in industry there is often a foreign body present the entry of which has not been noticed by the patient For this reason it is best to refer every case of conjunctivitis to a trained sister or doctor for investigation In industry conjunctivitis may also be caused by chemical fumes

Haemorrhage under Conjunctiva

It is appropriate here to mention the haemorrhages which sometimes occur under the conjunctiva The whole of one side of the white of the eye is red giving a some

what alarming appearance but the patient feels nothing abnormal Usually a sub-conjunctival haemorrhage is not at all serious but nevertheless it is a wise precaution to refer all such cases to a doctor

Welding and the Eye

Exposure of the unprotected eye to gas or electric welding or cutting is the commonest cause of conjunctivitis in industry There are three common types of welding

Spot welding The operator ought to wear goggles or have the eyes protected with a mica or other transparent shield The only risk to the eye is from sparks Eye injuries from spot welding should be referred for expert treatment as tiny pieces of metal are usually stuck to the burnt conjunctiva

Gas welding Oxygen (4 000 degrees Fahrenheit) and acetyline (6 000 degrees Fahrenheit) are the common flames used

Electric arc welding The temperatures here are similar to those with gas welding The welding rod is one electrode and this melts to fill the space between the metals to be welded

Welding or cutting places should be well ventilated as certain harmful gases are present they should also be screened to prevent exposure to the strong ultra violet rays which are produced particularly with gas and electric welding

Arc-eye or Welder s Flash

Welder s flash follows exposure of the unprotected eye to gas or electric welding or cutting The operator must use dark goggles or a dark shield and most operators are fully aware of this. The main risk is to his helper mate or learner or to a careless passer by Momentary exposure is enough and trouble can be caused up to 200 feet away especially if exposure is prolonged The condition resembles snow blindness

The eye is red watery and uncomfortable and the patient will usually remember momentary exposure to a welding flash four to eight hours previously When there is no such recollection it may be impossible for the first aider to distinguish this condition from a foreign body

For safety all cases of arc-eye should be referred for treatment. The first aid treatment is to wash out the eye with water or a simple solution, but a special arc eye lotion and other special preparations are more effective * These preparations however are best applied by a trained nurse Dark glasses give some relief

Exposure of the unprotected eye to infra red rays from furnaces molten glass or white hot metal can over many years, damage both the lens and the cornea The result is opacity of the lens or cataract Modern methods of protection have virtually completely eliminated this particular condition

Chemical Splashes in the Eye

In dealing with chemical splashes first aid is of the utmost importance since it can if done promptly and efficiently save sight As with chemical burns of the skin

* In some f ctories a simpl ey lotion nd an ey b th are p o ided n the weld g-shop the welders being instructed to wash out their eyes at the end of each d y work

alkalis are more dangerous even than acids Unless the alkali is removed at once it combines with the tissues of the eye and goes on acting on the tissues long after the eye has been thoroughly washed out A neglected alkali burn of the eye will in consequence continue to increase in size and depth despite washing with antidote and this may cause loss of vision

The common alkalis liable to get splashed into the eye are caustic soda ammonia (especially from refrigerator plants) lime and cement Other liquids used in industry *which may get into the eye are the industrial acids* mentioned earlier thinners solvents and de greasers Although these should all be flushed out as quickly as possible they are less likely than alkalis to cause permanent damage

Treatment

Unless antidote is immediately available the head should be held under a tap or plunged into a bucket of clean water the victim should then blink vigorously A drinking fountain gives quite a good eye irrigating jet

The patient may have difficulty in opening the eye because of spasm He should be told to try to hold both eyes open If the first aider is trying to irrigate the eye with water or antidote the patient should sit or lie with the head tilted right back *and an assistant should hold the eye open if no assistant is available the first* aider may use the first and second fingers of the left hand The jet of water or anti dote should not be directed right on to the front of the eye instead the patient should be told to look outwards and the jet directed on to the inner angle of the eye (*Fig* 57) Every industrial first aider should have experience of irrigating an eye at the giving and receiving end there are few more useful class exercises

Wherever there is a high risk of alkali or acid splashes buffered phosphate should be supplied with an irrigating bottle or storage canister (*Fig* 58) As explained earlier this solution will neutralise either acid or alkali *It may also be used quite* safely for splashes with other industrial chemicals but it has no advantage over water or salt solution (saline) *

Irrigation should be continued with short rest pauses for the patient for five to ten minutes The patient should then be transferred as swiftly as possible to expert nursing or medical care for inspection and further irrigation if necessary After alkali splashes this irrigation may have to continue for up to an hour

Lime or Cement

The principle of treatment for lime or cement is just the same as for other splashes Flood the eye with water salt solution or buffered phosphate immediately and go on flooding for at least five minutes Speed is vital *Often the only source* of water on a building site is a stand pipe The eye should be held open under the stand pipe tap even if it means soaking the patient s clothes A wetting is a small

Some doctors pref to provide a 5 per cent solution of ammo m chloride a the first a d tr atme t f lkal spl h the eye On b lanc we prefe the buff ed phosphate solut o as it s less ir tat g d eq lly effecti e ag nst both alk lis d ac ds

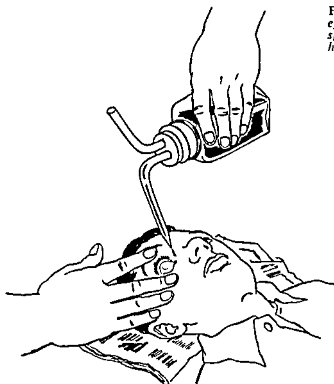
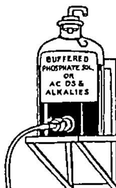


FIG 57 (left) *Washing out an eye following a chemical splash The irrigating bottle is held in the left hand and the eye is held open*



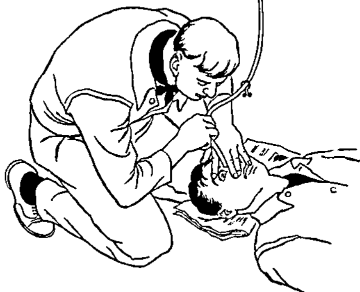


FIG 58 (right) *Washing out an eye following a chemical splash using buffered phosphate from a storage canister The five gallon glass canister is mounted on a wall bracket As soon as the bulldog clip on the rubber tube is loosened a jet of solution gushes out Note the wire hook on the neck of the canister for holding the rubber tube when not in use and the wire across the bottom of the bung to prevent it coming out The patient is lying flat on the floor with his head on a piece of newspaper the eye is held open and the jet of antidote is directed into the inner angle of the eye*

price to pay for the prevention of permanent damage to the eye Eyelid spasm may be considerable the first aider must overcome this by pulling the eyelids apart under the tap

All such cases should be seen as soon as possible after emergency first aid treatment by a trained nurse or doctor

Thinners and Solvents

Again the principle and method of treatment for thinners and solvents are exactly the same Thinners and solvents are less dangerous to the eye than acids and alkalis. Even though the thinners or solvents may not mix well with water the mechanical action of the flooding will quickly remove the irritant.

Bandaging an Eye

Whenever an eye condition has to be sent for further treatment to a nurse a doctor or hospital the eye should be covered with a bandage This can be easily and swiftly done with a medium sized individual sterilised dressing (*Fig* 59) It is important to pass the bandage over and under the ear on the affected side

Under the 1960 first aid box regulations boxes must contain sterilised eye pads in sealed packets These do not differ substantially from the medium sized individual sterilised dressings and either may be used to cover an eye in exactly the same way

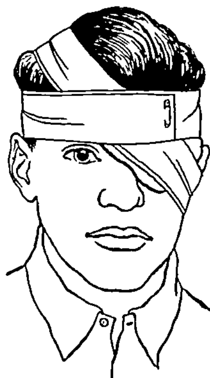


FIG 59 *Medium sized individual sterilised dressing used as an eye bandage Note that the bandage passes above and below the ear on the injured side The method of applying the official sterilised eye pad is precisely the same*

Prevention

If goggles or protective face shields were more widely worn in industry eye injuries whether from chemical splashes or foreign bodies would be far fewer There may be a traditional reluctance in certain factories to wear goggles or where the need is only occasional they may be forgotten Sometimes unsuitable goggles mist up and prevent the proper performance of the job a face shield which is not closely applied round the eyes may be the answer It is unrealistic to expect workers to wear goggles when the risk to the eyes is slight But when the risk is great not to protect the eyes is to endanger one s capacity to make a living

Here are some practical points about the relative dangers of different processes and materials Grinding wheels should always be eye guarded either by transparent plastic shields fitted to the mountings or by the wearing of goggles Some metals fracture more easily than others and therefore shoot off dangerous particles when worked examples are aluminium and magnesium alloys and bronze Mild steel flies more than cast iron A continuous cutting lathe is less dangerous than one with an intermittent cut because continuous swarf does not usually fly Fettling and milling with an interrupted cutter are both potentially dangerous Flying particles of wire can be very dangerous but when trimmed some types of wire fly more than others Another wire danger arises when particles fly off wire brushes used for cleaning structural steel

The first aider has a real part to play in encouraging the use of eye protectors whenever there is substantial danger He must himself set a good example and can help his work mates by making sure that they appreciate the risks they are running by not protecting their eyes on the more dangerous jobs

Chapter 13

Aches and Pains Transport Records

In dealing with illness as opposed to injury the industrial first aider is in much the same position as the sensible mother of a family in the home He must sternly resist the temptation to try to become a semi skilled doctor His job is to make not diagnoses but rather some simple practical decisions

1 Is the condition a minor one which will get better quickly at work?

2 Is the patient sufficiently ill to be sent to the factory surgery or industrial health centre or if these are not available to his home?

3 Is the patient so ill that skilled help must be sent for at once?

The major emergencies of factory life have already been dealt with and the first aider who knows his job should be able to recognise shock (even when caused by internal trouble such as stomach bleeding or a heart attack and not by an accident) strokes and epilepsy and semi consciousness in a diabetic

There are however many other types of serious illness which can just as often start at work as anywhere else The capacity to recognise serious illness with certainty comes with experience The only reliable working rule is If in doubt always play safe and send for help or refer to a trained doctor or nurse The seriously ill patient should be kept lying down until expert help arrives

In reaching his decision the first aider will find it helpful to ask himself the following questions Is the patient able or unable to do his job? Does he look ill? Is his colour different from what it usually is? Does he stand or sit as though in pain? Is he sweating? Is his breathing laboured or rapid? Does he complain of pain on breathing? Is he feeling sick? Has he actually vomited or had diarrhoea? Is any pain he may complain of unusual for him?

Only when the first aider is satisfied that the condition is indeed trivial is he justified in proceeding further on his own

Care of Minor Aches and Pains

The Harlow first aid box contains four items for use in appropriate cases of aches and pains a clinical thermometer bismuth or magnesium trisilicate tablets aspirin phenacetin and caffeine tablets and iodised throat tablets

Thermometer Every first aider should know how to take a patient s temperature and read a clinical thermometer It has been a surprise to discover how many first aiders cannot carry out these simple manoeuvres Here an ounce of demonstration is worth a pound of precept

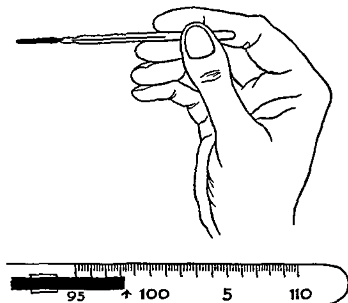


FIG 60 *Reading a clinical thermometer The thermometer which may have a spherical or oblong mercury container is held in the right hand and slowly rotated until the mercury in the stem is seen magnified When the thermometer is in the correct position the two parallel lines just below 95 act as a guide to finding the mercury*

The thermometer should be held in the right hand and slowly rotated (*Fig* 60) At a certain point it will be seen that its contents are magnified and the column of mercury which it contains shows up quite clearly An arrow or other special mark indicates the normal figure of 98 4 degrees Fahrenheit The mercury column should be well below this If it is above up to or even near the normal mark the thermometer should be shaken vigorously until the mercury is well down in the lower nineties

The thermometer is then placed in the patient s mouth under the tongue and the mouth must be kept shut It must remain in place for at least two full minutes this applies to the so called half minute thermometer as well as to the two minute one The mark to which the mercury has risen indicates the patient s temperature

Before the thermometer is replaced in its case it should be carefully washed under a cold tap dried with a piece of clean cotton wool strip and shaken down If washed under a hot tap the mercury may expand so much that it breaks the thermometer

The first aider may legitimately take the temperature of any patient who feels ill If the temperature is above normal the patient must be referred to a trained nurse or doctor But a normal or subnormal temperature does not necessarily mean that there is nothing the matter If the patient looks or seems in any way ill in him self referral is essential

Bismuth or magnesium trisilicate tablets (dose 1 2 tablets) may be safely and

beneficially given to the patient with a hang over or to the regular gastric suf ferer who is under medical treatment but is caught without his powder They should not be given to anyone who appears to be ill Unless the tablets give speedy relief the patient should be referred Severe stomach pain should never be treated by the first aider

Aspirin phenacetin and caffeine tablets (dose 1 2 tablets) relieve the mild head aches of ordinary life and may help women workers who have pain at the periods It is wise for period pain to be dealt with only by women first aiders A severe headache or a headache accompanied by any other symptoms should always be referred to a trained nurse or doctor

Iodised throat tablets give some relief to winter coughs and colds (A tablet may be sucked once an hour up to four tablets in all) In such cases the temperature should always be taken if the patient looks at all ill Sore throats are best referred as also are coughs or colds accompanied by pain in the chest

Taking the pulse is more difficult than taking a temperature and it is outside the proper scope of the first aider

Moving an Injured Person

As a general rule any severely injured or ill person should be moved as little as possible until experienced ambulance workers nurses or a doctor are available The transport of the injured is a specialised branch of first aid calling for con siderable practical training and experience Such training and experience is possessed by ambulance workers and is rightly emphasised in the St John courses The industrial first aider may occasionally have to move someone out of a position of immediate and continuing danger and in emergency may have to undertake a longer carry to an ambulance or first aid post To meet these emergencies some practical experience on the lines set out below is essential For the demonstrations of work here described a stretcher two blankets and a strong scarf are the only equipment needed

It is difficult but not impossible to move an injured person safely without a stretcher It is easier both to load and to carry a stretcher with four bearers than with two It is easier to move a patient without a stretcher with two bearers than with one But in emergency one person can move another provided that the proper techniques have been learnt

Preparing a Stretcher

If two blankets are available they should be arranged on the stretcher in what is known as the fish tail position (*Fig* 61) The patient s feet and legs are covered with the fish tail and the body and head wrapped in the lower blanket tucking in firmly with the longer side (*Fig* 62)

If only one blanket is available it should be arranged on the stretcher dia gonally The patient is then folded into the blanket with the longer angle being turned over on top and tucked in (*Fig* 63)

Loading a Stretcher

Ideally there should be four loaders one of whom must give orders so that all act together Three men lift the patient the fourth pushes the stretcher with

blanket or blankets under the lifted patient so that he can be gently lowered in the right position on the stretcher

The three man lift is an art to be perfected by practice Its object is to lift the patient while keeping the head body and legs in a straight line All three men must be on the *same* side of the patient They all kneel on one knee in each

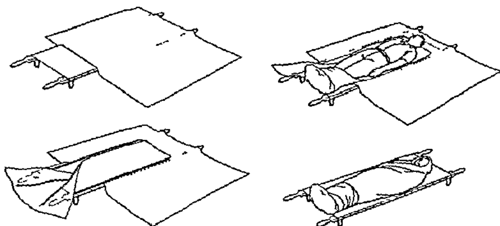


FIG 61 (Left) *Preparing a stretcher for a patient using two blankets – the fish tail method Note there is more of the first blanket on the one side of the stretcher than on the other and that there will be four thicknesses of blanket under the patient's body but only one thickness under his head* FIG 62 (Right) *The fish tail method with the patient in position The feet are tucked up in the fish tail and the body and head wrapped in the lower blanket using the longer side for the final tuck in*

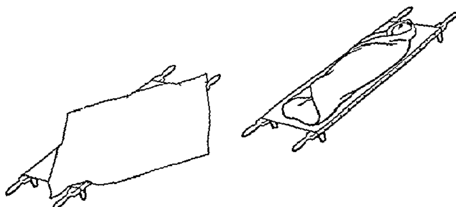


FIG 63 *Using a single blanket on a stretcher to its best advantage The blanket is placed diagonally with more on one side than the other The larger section will be used for the final tuck in*

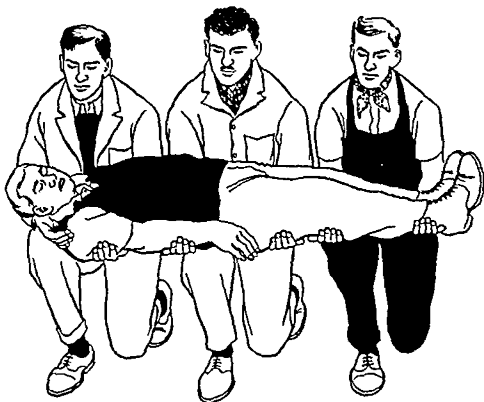


FIG 64 *The three man lift This is the ideal method of lifting an injured man and loading a stretcher Note that all three bearers are on the same side of the patient that the patient s head body and legs are kept in a straight line that the bearers knees nearest the patient's head form a shelf on which to rest the patient while the stretcher is placed in position and that the bearer at the head end supports the head in the crook of his elbow This method may also be used for carrying over a distance*

case the knee nearer the patient s feet Their other knees – the knees nearer the patient s head – form a shelf on which the patient can be rested Hands and arms are gently but firmly insinuated right under the patient The first man has to raise the head and shoulders The second man who should be the strongest has to raise the chest and abdomen The third man has to raise the legs with one arm under the thighs and the other under the calves he must take care not to let the feet sag and the knees bend (*Fig* 64) When all are ready the leader gives the command to lift and the patient is raised and rested on the lifters bent knees so that the stretcher can be slipped into position Again the leader must give the command to lower so that all three move as one

The three man lift may also be used for carrying a patient a short distance It is then spoken of as the human stretcher If only three loaders are available they will use the three man lift and carry the patient to the stretcher

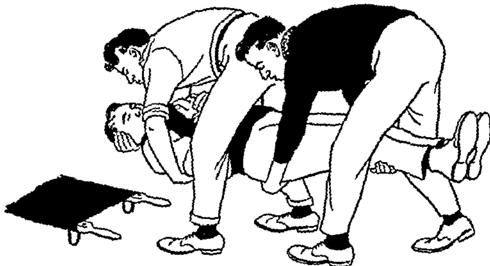


FIG 65 *The two man lift or straddle walk Both bearers stand astride the patient facing his head The first passes his arms under the patient's shoulders the second passes one arm under the buttocks and the other under the calves The man in the rear gives commands*

If there are only two loaders available both should stand astride the patient facing his head The first passes his arms under the patient s shoulders the second passes one arm under the buttocks and the other under the calves (*Fig* 65) When both are in position the man in the rear gives the command to lift With short steps they then walk *over* the stretcher and lower the patient on to it This procedure is known as the straddle walk

It is sometimes necessary to load an unconscious patient on to a stretcher The rules are these lift in the prone position carry in the semi prone position Attempts to lift in the semi prone position are dangerous as the unconscious patient may roll out of the lifters arms Carriage in the prone position is difficult because of the position of the patient s arms also the air way may be obstructed

The transport of the patient with a broken back or neck has already been dealt with under the care of fractures in Chapter 7

Carrying a Stretcher

Carrying a stretcher is more difficult than it looks Practical experience is needed both as a bearer and as a patient It is surprisingly easy for the unskilled to tip a patient off a stretcher

There has been much discussion as to whether it is better to carry a patient head first or feet first We support the conventional St John method of carrying feet first, though there are exceptions to this for example when lifting into an ambulance The strongest man or men should be at the head This is because the upper half of the body is heavier than the lower half The command to lift move

forward and stop should be given by one of the men at the rear end of the stretcher Care must be taken to keep the stretcher level and the bearers must walk out of the traditional marching step otherwise the stretcher will soon start to swing The smoothest carry is achieved by all four bearers adopting the rhythm inner foot – outer foot inner foot – outer foot etc (*Fig* 66)

The Blanket Lift

Four men can carry a severely injured man making use of a single blanket The blanket must first be inserted under the injured man This is done by rolling up the blanket longways and placing the roll beside the patient Three people pull the patient towards them and a fourth inserts the roll under the patient (*Fig* 67a) The patient is lowered on to the roll then pulled or pushed up the other way (*Fig* 67b) this enables the roll to be pulled through The patient is then lowered on to the blanket. At the outset the blanket should be so placed that when the patient is in position a small roll can be made along each side of the patient For lifting one man takes hold of a half of each of these small rolls and the blanket is lifted and moved like a stretcher (*Fig* 67c) Note particularly the position of the bearers hands The hands in the middle of each roll must be close together Otherwise it is impossible to maintain the tension on the blanket needed to keep it flat An efficient blanket lift is impossible with fewer than four bearers

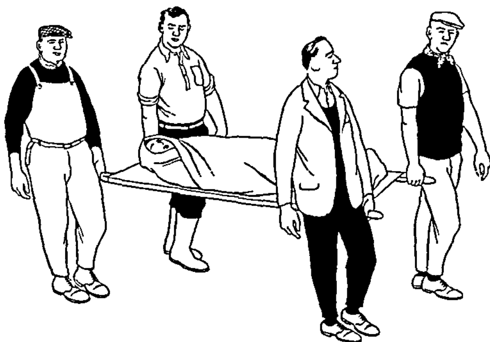


FIG 66 *Four men carrying a stretcher Note that the strongest men should be at the rear end of the stretcher nearest the patient's head one of these men should give commands The rhythm of walking should be inner foot – outer foot instead of left – right*

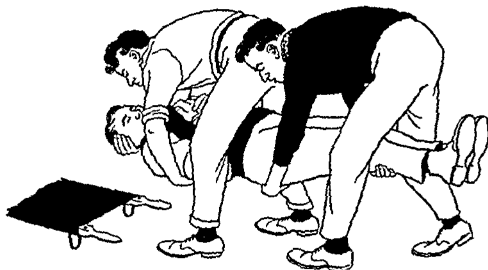


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FIG 68 The bandy-chair lift The patient must be able to use his arms to grip round the neck of his carriers

The Chair Lift

If a patient can stand or sit but cannot walk two men can move him by means of a chair lift

The familiar bandy-chair (*Fig* 68) needs no equipment but the patient must be able to use his arms to grip round the necks of his carriers

Much better is a real chair This is carried by two men facing each other each man grasps the back of the chair and a front leg close to the point where it joins the seat (*Fig* 69) Care has to be taken not to tip the patient forwards The real chair lift makes it comparatively easy to carry a patient up or down stairs

Single handed Lifts

If a patient can just stand and has the use of his arms the familiar pick a back is useful For the pick a-back the rescuer must use both his hands and cannot therefore climb a ladder

The fireman s lift leaves a hand free and so makes ladder-climbing possible It demands considerable strength on the part of the rescuer and a good balance it cannot therefore be used if the patient is very heavy unless the rescuer is proportionately strong

The patient must be helped to stand upright facing the rescuer The rescuer

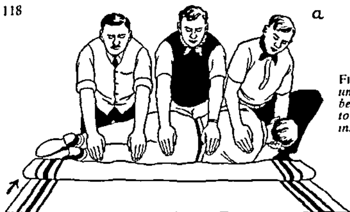


FIG 67a *To get the blanket under the patient three bearers pull the patient towards them while a fourth inserts the rolled blanket under the patient*

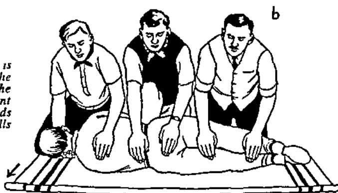


FIG 67b *The patient is lowered on to the roll the bearers move over to the other side of the patient and again pull him towards them the fourth bearer pulls out the rolled blanket*



FIG 67c *The blanket on either side of the patient is rolled and one bearer takes hold of each half roll Considerable tension is needed to keep the blanket flat*

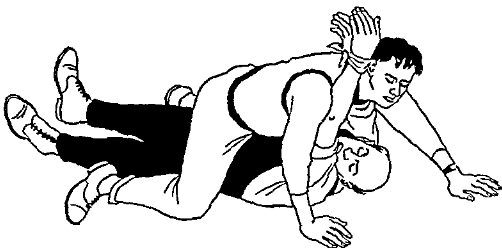


FIG 71 *The neck-drag The patient's wrists are tied together and looped over the rescuer's neck*

under the shoulders and pulled along head and shoulders first in a semi sitting position On no account must a patient be dragged by the feet as the risk of injury to the head is then great.

Records in Industry

The law requires certain records of industrial accidents to be kept but for the most part minor accidents are excluded The first aider in charge of a first aid box or post is however wise to keep a complete record of all that he does Such a record may be kept in an ordinary exercise book appropriately ruled up it is called a *Day Book* The *Day Book* should give the date and the name of the patient the nature of the injury or condition the cause if this can be stated the treatment given and the disposal (back to work to factory nurse or doctor or to own doctor or hospital as the case may be) Simple abbreviations will soon be devised Writing must be kept to a minimum or it will soon be neglected The *Day Book* should be kept in the first aid box

The *Accident Book* is a special cream coloured ruled up book issued by the Ministry of Pensions and National Insurance with space for over 1 000 entries It is the statutory duty of the employer to provide this book but the duty of filling it in rests with the employee or his agent It is the basis for claims for industrial injury benefit * if the injury involves time off work It is also a notification of the accident to the employer he then has the duty to investigate its circumstances

It is necessary to record in this book only injuries or industrial illnesses which are likely to lead to time off work But because it must often be difficult to foretell which injuries are serious and which are not some employers allow their first aid

* Entry in the Accident Book does *not* however absolve the employee from lodging a claim within [illegible] days at the local office of the Ministry of Pensions and National Insurance

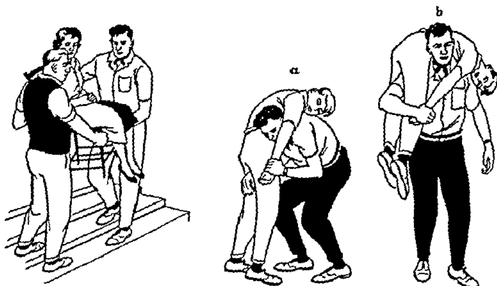


FIG 69 (Left) *The real chair lift This is of special value in going up and down stairs Care must be taken not to tilt the patient forward*

FIG 70 (Right) *The fireman s lift (a) Rescuer grasps patient s right wrist with left hand rescuer s right shoulder into patient's stomach right arm between patient's legs right hand grasps patient's right leg (b) Weight of patient taken on rescuer s right shoulder patient's right arm pulled well over rescuer s left shoulder patient's right wrist grasped by rescuer s right hand leaving his left hand free*

grasps the patient s right wrist with his left hand then bends down until his head is just under the patient s right hand This brings the rescuer s right shoulder level with the lower part of the patient s abdomen He then puts his right arm between (or round) the patient s legs and grasps the leg (or legs) firmly The weight of the patient is then taken on his right shoulder As he rises to stand upright the patient is pulled across both shoulders The patient s right wrist is then transferred to the rescuer s right hand thus leaving his left hand free (*Fig* 70a and 70b)

A little practice will soon demonstrate the value and the limitations of the fireman s lift.

The Neck Drag

The single handed movement and rescue of an unconscious or badly injured patient is effected by the neck drag The only equipment needed is a strong scarf belt or tie The patient s wrists are tied together The rescuer kneels astride the patient with his knees in the patient s armpits The rescuer loops the patient s hands over his own neck (*Fig* 71) As he crawls forward he pulls the patient forward on his own neck and shoulders This method of rescue is used by soldiers when under fire

If a patient has to be pulled a short distance only he may instead be grasped

Chapter 14

A Miscellany

In this last part of our picture of first aid in the factory we shall draw together a number of points which have escaped mention earlier Some of these points have been raised by doctors engaged in teaching factory first aiders Other have been brought out by first aiders themselves Others again have come from workers and employers in the building and civil engineering industries First aid in industry outside the factory in the shop or transport depot on the farm or the building site does not differ in any essential way from the teaching set out here but minor points need explanation or amplification Because this a true miscellany of replies to practical problems the Socratic method of question and answer has been adopted

Contents of First aid Boxes

What should a factory first aid box contain?

Under the First aid Boxes in Factories Order 1959 (Statutory Instrument 1959 No 906) operating from January 1 1960 factory first aid boxes must contain the items set out in the upper half of Table 1 The lower half of the table gives the supplementary contents which we have found essential for efficient factory first aid

The table calls for a number of comments

1 For every item the quantity officially specified is a minimum only

2 In our experience the number of *small individual dressings* specified for each type of box is on the high side These dressings are used only for major injuries to fingers which are comparatively rare These small dressing cartons are apt to fall out of first aid boxes whenever they are opened For this reason the bulk of the supply is best kept in a drawer adjacent to the first aid box

The same applies to the number of *medium* and *large individual dressings* specified for Boxes B and C Again most of them are best stored in a handy drawer

3 The recommended supply of assorted *adhesive wound dressings* is in our experience too small These are by far the most frequently used dressings in industrial first aid Under a supplementary order made by the Chief Factory Inspector these dressings have to be put up in individual sealed packets This adds to their cost but in typical factory conditions it is an advantage In the Chief Inspector s original order (Form 694 1949) the dressing itself in the centre of the plaster was specified as unmedicated A variant of this order (Form 694 revised 1949) allows the dressing to be impregnated with a variety of medicaments In our view the unmedicated dressing is to be preferred users should insist on the omission of useless possibly dangerous antiseptics

4 No size is specified for the roll of *adhesive plaster* It will be used only to fix bandage ends to prevent their catching in machinery For this purpose we recommend ½ inch unmedicated plaster

workers to use the *Accident Book* as a *Day Book* for which it is well suited The consumption of accident books is then greatly increased But the employee's rights are safeguarded and the employer is guaranteed a full picture of what is happening at each first aid post

The *General Register for Factories* is a special blue ruled up book issued by the Ministry of Labour It is the statutory duty of the occupier of the factory (the employer) to see that it is filled up Normally it is not dealt with by the first aider but he should be aware of what ought to go into it so that he can report such matters at once

Part III of this *Register* is for Accidents and Dangerous Occurrences This has to be filled in for any accident involving *more than* 3 *days* disablement from earning full wages at normal work or for any fatal accident For these cases the employer also has to fill in *Form* 43 and send it to HM District Inspector of Factories

A record also has to be kept and *Form* 43 filled in for certain special types of accident whether or not anyone is injured These include crane accidents explosions and the bursting of any revolving object Notifiable industrial diseases also have to be recorded and reported

5 No number is specified for the ½ ounce packets of *cotton wool* Such packets are needed only for dealing with fractures or mopping up large quantities of blood These occasions will be comparatively rare but for each fracture or severe injury a substantial amount of cotton wool will be required We therefore suggest six packets to each box they may be stored with advantage outside the box in a drawer

6 The approved *eye ointment* specified by the Chief Factory Inspector (Form 693 1949) is a 6 10 per cent sulphacetamide sodium sterilised ointment in a water miscible base The amount specified is 60 grains in a collapsible tube with a nozzle and cap In our opinion it should not be used by first aiders

7 A *rubber bandage* is beyond the capacity of the first aider to apply properly it should not, and indeed need not be included Any bandage or an individual sterilised dressing may be used as a *pressure bandage* so no special one need be supplied

8 Every first aid box must be plainly marked First Aid and should also carry the name of the first aid worker in charge of it

9 There must be at least one first aid box for each 150 employees in a factory Thus if there are 170 employees one Box C and one Box B will be needed If however a properly equipped ambulance room is available the factory inspector can give exemption from this requirement

10 *Roller bandages* used to be a statutory requirement in the larger factory first aid boxes but are now omitted from the official list In our experience they are essential as the best means of protecting adhesive wound dressings from oil or other dirt They are therefore retained in our supplement

11 The formula of the *tablets* recommended in our supplement is as follows

(*a*) There are three alternative antacid tablets

i Tab Magnesium Trisilicate Co (*National Formulary*)

contains	Mag Trisil	gr	4
	Alum Hydrox	gr	2
	Ol Menth Pip	min	1/20

or

ii Bismuth and Magnesia Tablets

contain	Bismuth Carb	gr	1
	Sodium Bicarb	gr	½
	Mag Carb Pond	gr	3
	Excipient ad	gr	7
	Peppermint oil flavouring		

or

iii Tab Mag Carb Co (*NF* and *BPC*)

contains	Mag Carb Pond	gr	3
	Calc Carb	gr	3
	Sod Bicarb	gr	2
	Light kaolin	gr	1
	Ginger and peppermint oil flavouring		

(*b*) Tab "A P C

Tab *Acid Acetylsalicyl Co* (*NF* and *BPC*)

contains	Acetylsalicylic Acid	gr	3½
	Phenacetin	gr	2½
	Caffeine	gr	½

(*c*) " Iodised throat tablet

contains	Liq Iod Mit	min	1/10
	Phenol	gr	1/24
	Menthol	gr	1/48
	Methyl Salicyl	min	1/100
	Excipient ad	gr	10

TABLE I Contents of Factory First aid Boxes

	Box A (for factories with up to 10 employees)	*Box B* (for factories with 11-50 employees)	*Box C* (for factories with more than 50 employees)
Small individual unmedicated sterilised dressings for fingers (No 7)	6	1	4
Medium sized individual unmedicated sterilised dressings for hands and feet (No 8)	3	6	12
Large individual unmedicated sterilised dressings for other injured parts (No 9)	3	6	12
Assorted adhesive wound dressings	1	4	36
Triangular bandages of unbleached calico at least 36 x 36 x 51 in	2	4	8
Adhesive plaster		a sufficient supply	
Absorbent sterilised cotton wool in ¼ oz packet		a sufficient supply	
Approved eye ointment		a sufficient supply	
Individual sterilised eye pads in separate sealed packets	2	4	8
Rubber or pressure bandage	1	1	1
Safety pins		*no number specified*	
Ministry of Labour Leaflet on First Aid (Form 1008)	1	1	1

The *supplement* which we recommend to carry out efficient factory first aid is as follows

Cotton wool dispenser containing cotton wool strip	1	1	1
Individual cotton wool applicators for eye foreign bodies in an envelope	6	6	6
Self sealing crepe rubber inch roll	1	1	1
Roller bandages 1 in	6	9	12
Roller bandage 2 in	6	9	1
Individual sterilised tulle gras dressings in a tin	1	1	1
Cetrimide 1 per cent in 5 10 or 0 oz bottle (depending on space available in box)	10 oz	0 oz	20 oz
Gallipot white enamel 2 oz	1	1	1
Kidney dish white enamel 6 in	1	1	1
Non inflammable plaster remover one 4 oz bottle	1	1	1
Eye-bath unbreakable	1	1	1
Small unbreakable tumbler	1	1	1
Blunt nosed surgical scissors with chain attached	1	1	1
Splinter forceps	1	1	1
Clinical thermometer	1	1	1
Tablets			
Magnesium trisilicate or other antacid	50	50	50
Aspirin phenacetin and caffeine	50	50	50
Iodised throat tablets	50	50	50

large wounds may occur to stop haemorrhage from a typical large wound three large wound dressings are a minimum requirement On a farm major fractures are more common than in a factory To deal with these the recommended supply of cotton wool and triangular bandages is inadequate

We would advise the prudent farmer to equip his boxes or containers according to our lists (with the supplements) set out in Table 1 By so doing he will perform fully what the law requires of him and at the same time make possible efficient first aid for his workers

Are there any special rules about first aid for workers in the food industries and in canteens?

Yes Under the Food Hygiene Regulations 1955 (Statutory Instrument 1955 No 1906) workers in the food industries have to keep all cuts and abrasions on exposed parts (that is the hands arms and face) covered with a suitable *waterproof* dressing This provision is met if the assorted adhesive wound dressings in the first aid box are of the waterproof variety

The first aid worker in such industries will be wise in addition to cover any dressing on the fingers with a waterproof plastic finger stall secured by tapes around the wrist This precaution keeps to a minimum the risk of an adhesive dressing coming loose and getting into food in the course of its manufacture or preparation

The Food Hygiene Regulations also specify that the first aid stocks provided in food industries must include suitable and sufficient *bandages* and *antiseptic* Neither of these are now included in the official factory first aid boxes They are however included in the supplement which we recommend Thus our boxes will fully cover the statutory requirements in the food industries

The Regulations also require a notice to be fixed in each lavatory asking everyone to wash their hands after using the lavatory

Wound Treatment

Why is no skin cleansing agent included in the official factory first aid box?

It appears that officially first aid is still looked upon as a preliminary to further expert treatment This is sound enough for anything more than minor injury But the great bulk of industrial first aid is concerned with minor injury and most small cuts in industry as in the home are never seen by a nurse or a doctor

It is however officially accepted that an adhesive wound dressing will not stick to oily skin Accordingly it is suggested that the oil around the wound should be wiped off with cotton wool before an adhesive plaster is applied In our experience this is far less satisfactory than using cetrimide

Are there any disadvantages arising out of the use of cetrimide?

In our experience a 1 per cent solution of cetrimide is the ideal wound and skin cleanser provided three points are remembered

1 Always wipe off all the cetrimide from the wound and skin with clean cotton wool after it has been used This is essential to get the plaster to stick and to avoid the development of sensitivity to cetrimide

What should a first aid box on a building or civil engineering site contain?

Under the "Building Operations (First aid Boxes) Order 1959 (Statutory Instrument 1959 No 2080) there are only two types of box specified

1 Where the number of employees is between 11 and 25 the contents are exactly the same as the official list for Box A in Table I

2 Where the number of employees exceeds 25 the contents are exactly the same as the official list for Box C in Table I

In both boxes we strongly recommend the inclusion of our supplementary items

If there are 10 or fewer employees on a building site no first aid box is required by law Yet the wise employer will instal Box A with our supplementary items

What should a first aid box for a dock wharf or quay contain?

Under the Docks (First aid Boxes) Order 1959 (Statutory Instrument 1959 No 2081) there are three types of box specified Their contents are identical with the official lists for Boxes A B and C given in Table I The size of box in relation to numbers of workers is the same but the number is the number of persons working at *any* one time at the work place

As elsewhere we advise the inclusion of our supplementary items

What should a first aid box on a farm contain?

The regulations for farms were drafted two years before the new regulations for factories and other work places In consequence they are not in line with the new factory provisions The provisions under the Agriculture (First aid) Regulations 1957" (Statutory Instrument 1957 No 940) are set out in Table II

The following comments must be made on the table

1 It will be seen that the contents of the Container Z is identical with that of Box Y although it is supposed to meet the needs of up to three times as many workers

2 If more than 30 workers are employed at one place an additional container Z has to be supplied for every 30 workers but no employer need supply more than 3 containers in any one farm unit Any number less than 30 is to count as 30

3 This order is badly drafted In parts it is virtually incomprehensible Moreover it is out of touch with the realities of first aid on the farm

We can see no difference between a "finger" wound dressing and a "small" wound dressing. No "large" wound dressings are included Yet the farm is just the place where

TABLE II Statutory first aid requirements for farms

	Box X (for 3 or fewer workers)	*Box Y (for 4-10 workers)*	*Container Z (for 11 30 workers)*
Sterilised wound dressings			
Finger	3	6	6
Small	2	3	3
Medium	2	3	3
Triangular bandages	2	3	3
Waterproof adhesive wound dressings			
1½ × 2 in	3	6	6
2 × 3 in	3	6	6
Absorbent cotton wool ½ oz packet	1	2	2
First aid leaflet issued by Minister of Agriculture	1	1	1

vidual sterilised dressing and the patient sent for further treatment from a nurse or doctor If the wound is on the top of the head the bandage attached to the individual sterilised dressing should pass below and be tied under the chin If the wound is on the back or front of the head the bandage attached to the dressing should pass round the head from the forehead to the junction of the head and neck at the back

After one or more individual sterilised dressings have been applied to a scalp wound it will sometimes be helpful to cover the whole head This is best done with a triangular bandage It is put on exactly as a woman puts on a head scarf The long side of the triangle is held along the back of the head The top point is drawn over the top of the head to the front The two side points are drawn round the sides of the head and tied in front over the top point

Should tubular dressings be used by first aiders?

In skilled hands these dressings are of great value But in unskilled hands they may be dangerous So their use is best restricted to trained industrial nurses

It was stated earlier that bee venom is not acid and wasp venom is not alkaline Is this really so?

We were wrong A doctor friend writes this I expressed the sting bags of a bee and a wasp and I find that the former acts on litmus as an acid and the latter as an alkali It is true however that the poisonous effects of these stings are not due to their being acid or alkaline but to the complicated organic compounds which they contain Hence treatment with neutralising agents is useless For a full account of the composition of wasp and bee venoms the medical reader is referred to Dr T K Marshall s article in *The Practitioner* June 1957 Vol 178 page 712

Planning a Course

How many lecture demonstrations are needed to teach industrial first aid and what should they cover?

Provided that the lecturer is concise and avoids irrelevance and discursiveness the course as set out here can be covered comfortably in six lecture demonstrations each lasting 60-75 minutes A fully stocked first aid box and a blackboard must be available for each lecture demonstration It is an advantage not to try to cover the course in less than six weeks This gives class members who are inevitably busy people an opportunity to read over and think about what they have learnt

The teacher should prepare his own detailed lecture notes before each class and revise them each time a lecture is repeated The quality of his teaching will be directly proportional to the trouble he takes beforehand

The outline synopsis which we use is as follows

Lecture 1

The nature of industrial first aid the first-aider s tools

How industrial first aid resembles and differs from ordinary first aid

The first aid box and where to put it individual sterilised dressings cotton wool adhesive plaster *protection from oil* the roller bandage the triangular bandage other items what to leave out.

2 Do not mix cetrimide with soap as this renders it inactive

3 Choose the correct bung for the cetrimide bottle Corks are liable to become contaminated with germs particularly the pus producing germ *Pseudomonas pyocyanea* Cetrimide will destroy this germ in a test tube but will not do so in the presence of organic matter for example cork So corks must never be used in cetrimide bottles We have tried rubber bungs but after some months of contact with cetrimide they become soft and slimy We have found a plastic screw cap the best answer

To counter the risk of contamination with *Pseudomonas pyocyanea* it is sometimes recommended that 0 1 per cent chlorhexidine should be added to the 1 per cent cetrimide solution Over a four year trial period cetrimide alone has in the hands of our first aiders at Harlow given uniformly satisfactory results We think that the addition of chlorhexidine is unnecessary for first aid purposes

What is the best way to protect an adhesive dressing from the action of solvents such as thinners ?

We have tried rubber and crêpe rubber finger stalls Both are useless as they dissolve within a few minutes The only protection of any value is a roller bandage carefully applied and frequently changed But even with this a new adhesive dressing will probably be needed every time the bandage is changed The only complete answer is to keep the wound and its covering away from the solvent

On a farm or a building site an adhesive dressing over a small wound on the hand needs special protection What do you recommend?

By far the best protection is a roller bandage properly applied and changed when necessary

How can a roller bandage be applied to protect an adhesive dressing over a wound on the palm of the hand?

The bandage should be wound round the whole hand alternatively above and below the thumb Get a trained nurse to give you a demonstration Then practise on a friend until you can do it as well as she does!

In applying a roller bandage to any part of the body remember the points made earlier in the section on the first aider s tools It is often an advantage to leave the first six inches of a bandage sticking out loose this can be held tight as a anchor to prevent the bandage slipping as it is applied The end of the bandage can be tied to this loose piece to finish off when the application is complete

In the building trade wounds of the scalp are common How can you apply an adhesive plaster or a roller bandage to the scalp?

Adhesive plaster will not stick to the scalp unless the victim happens to be bald There is a method of applying a roller bandage to the scalp but it is very difficult and beyond the capacity of almost all doctors most first aiders and many nurses

Small scalp wounds heal well with no dressing at all Clean the wound with cetrimide dry off the cetrimide with cotton wool and leave exposed to the air If however the wound is large ragged or gaping it should be covered with an indi

examined orally and must also do certain simple practical tests The industrial first aider will do most of his work and make most decisions on his own, so his individual capacity without the support of colleagues must be assessed

We have found it best to have two examiners – say a nursing sister and a doctor They should ask alternate questions but both should score all answers We mark each answer from 0-5 A fully stocked first aid box should be at hand and open One of the examiners should allow himself to be used as a subject In a fifteen minute oral examination it is usually possible to get through eight to ten questions

Is it right to let first aiders know the kind of questions they may be asked at examination?

This problem arises in every type of examination The short answer is that regardless of whether it is right or wrong resourceful candidates are bound to find out the questions asked previously from those who have taken the examination before So for most examinations the questions previously asked are now published for candidates to study

Knowing the type of question likely to be asked has one real advantage It takes away some of the anxiety with which the candidate approaches the examination and enables him to do more justice to himself Moreover the study of a well selected group of questions is an excellent method of revision

What type of questions may be asked?

Questions should be practical rather than theoretical and related as far as possible to the kind of situations which the first aider will meet at work It is important to achieve a good scatter so that ignorance in any particular field does not go undetected Accordingly the following specimen questions are arranged under eight subject headings At least one question should be asked on each of these subjects

Wounds

1 I have a two inch long cut on my forearm which is bleeding rather badly Select from the first aid box the dressing to apply and show me how you would apply it

2 Quite quickly blood comes through the dressing you have just applied What would you do to the wound the arm and to the patient generally?

3 I have a small cut on my finger How would you decide whether to deal with it yourself or to send it on to someone else?

If you decided to deal with it yourself how would you clean and dress it?

4 The patient has to return to an oily job How would you protect the wound and the dressing you have applied?

5 A man wearing rubber soled shoes has trod on a nail projecting from a plank What would you do?

6 A middle aged woman wheeling a tea trolley has slipped and cut her leg on a steel bar The cut although small is pouring out blood What has happened? How would you treat her?

7 Blood is squirting out from a cut on the wrist How would you deal with this?

8 How would you treat a blister on say the heel?

Severe Injury

9 A patient has collapsed in the lavatory He is just conscious pale and sweating His skin feels cold What is his condition called? What has probably caused it? How could you look after him?

Lecture 2

Principles and details of wound treatment

Major and minor wounds bleeding infection general treatment foreign bodies grazes and crushes wounds of the chest and abdomen nose bleeding ruptured varicose vein contusions blisters insect bites and stings

Lecture 3

The effects of serious injury fractures strains and sprains

Shock what the shocked patient looks like what happens in shock results of fluid loss management of shock crush injuries fainting

General consideration of fractures bones commonly broken and how to recognise them first aid care of fractures general and particular strains and sprains dislocations

Lecture 4

Burns and scalds physical and chemical injuries

Minor and serious burns different kinds of burn objects of first aid treatment of trivial medium and serious burns rescue from a burning building fire extinguishers

Electric burns electric shock types symptoms and treatment Heat injuries types care and prevention

Chemical injuries acids quick and slow acting alkalis chemical skin irritation chemical poisons

Notifiable industrial diseases

Lecture 5

Unconsciousness gassing and asphyxia artificial respiration

Unconsciousness where the cause is obvious where the cause is probable with no obvious cause care of the unconscious patient some don ts internal causes of unconsciousness fainting fits strokes diabetes alcohol hysteria

Rescue of a gas casualty industrial gases irritants smothering gases tissue poisons narcotising gases treatment of a gas casualty dust and fumes

Artificial respiration when it is needed speed preliminaries the Holger Neilsen method Eve s rocking stretcher Stephenson s Minuteman oxygen the airway

Lecture 6

The eye aches and pains records transport

Importance of eye injuries examining an eye removal of a foreign body glass scratches dust foreign body within the globe of the eye welding and the eye chemical splashes bandaging an eye prevention of eye injury

Aches and pains reading a thermometer tablets

Records the day book the accident book the register

Moving an injured person preparing a stretcher the three man lift carrying a stretcher the blanket lift the chair lift single handed lifts the neck drag.

Examinations in First Aid

How should examinations in industrial first aid be conducted?

The purpose of such an examination must always be kept in mind It is to see if the candidate is capable of doing first aid work safely and efficiently If he can do the job he should pass If not it is in the interest of all that he should fail We find that the great majority of candidates who have conscientiously attended a course based on the teaching set out here will in fact pass A few will pass but will be found to have inadequate knowledge of one subject they should be told this and re examined in this subject later A few will find the work beyond them

In our experience group examinations are useless Each candidate must be

10 You are called to a man with a severe crush injury of the hand Describe his general condition How would you look after him? He says he feels thirsty Would you give him anything to drink? Why or why not?

Fractures

11 What is meant by the word fracture? How can you tell if a patient has got a fracture? Suppose I had got a fracture of my forearm how would you deal with it?

12 What does a patient with a fractured hip look like? And a fractured wrist? And what does a patient with a fractured rib complain of?

13 Show me how you would use a triangular bandage as a sling?

Burns and chemical injuries

14 I have a small burn on my finger from a soldering iron Show me how you would treat it.

15 How would you deal with a petrol burn involving say six square inches on the arm?

16 How would you set about rescuing someone from a burning building?

17 I am pouring some acid from a carboy and some spills over my arm and hand and on to my trousers How would you deal with the situation? Suppose it had been caustic soda What would you do then?

18 How would you deal with a chemical splash in the eye?

19 How would you deal with cement or lime in the eye?

20 Tell me the names of some substances which are used in industry and may cause dermatitis What would you do if a worker came to you with a complaint of skin irritation?

The unconscious patient

21 You are called to an elderly man who is lying on his back unconscious and breathing heavily What would you suspect was the matter with him? What would you do?

22 What would you do for a patient who is having an epileptic fit?

23 What are the semi prone and the prone positions? When do you make use of these positions?

24 An unconscious patient smells of alcohol What conclusion would you draw?

25 A fellow worker whom you know to have diabetes comes up to you and tells you rather aggressively that he is feeling muzzy and can see double What would you do for him? Why?

26 How would you set about rescuing someone who has been overcome by coal gas?

Electric shock

27 How would you deal with a case of electric shock?

28 Is there anything peculiar about electric burns? What do they look like and how would you deal with them?

29 In what position would you place a patient before starting artificial respiration? What would be your position? Describe the movements you would make and the rhythm What apparatus might help you?

The eye

30 A patient says he has got something in his eye Show me how you would examine him

31 You can see a foreign body on the white of the eye What would you do? Suppose you have to send the patient on for expert help what would you do first?

32 The patient says he was using a hammer and chisel when he got something in his eye On examination you can see nothing unusual What conclusion would you draw and what steps would you take?

HARLOW INDUSTRIAL
HEALTH SERVICE



Edinburgh House
Templefields Harlow

Industrial First Aid Certificate

This is to certify that

- -

has attended a course of lecture-demonstrations on Industrial First Aid, and has passed an oral and practical examination to the satisfaction of the Service

Date..........

- - - - - - - - - - - - - - -
Chairman of the Council of the Service

- - - - - - - - - - - - - - -
Medical Director

FIG 72 *Specimen industrial first aid certificate issued to workers in Harlow who have attended a course run by the staff of the Industrial Health Service and passed an examination*

First Aid in Coal Mines another St John publication prepared in association with the Medical Service of the National Coal Board is a clinical work of outstanding value Apart from the specialised audience for whom it is planned it will be of help to all first aid workers in heavy industry

The First Aid Civil Defence Handbook No 6 (HMSO) is a comprehensive training manual for civil defence workers

Artificial Respiration by Dr T O Garland (Faber & Faber) is a beautifully illustrated little classic It should be read by every enthusiastic first aider and by every teacher of first aid

Resuscitation of the Unconscious Victim by Dr Peter Safar and M C McMahon (C C Thomas Springfield Illinois) gives a detailed account of mouth to mouth artificial respiration

Accidents How they happen and how to prevent them is a quarterly journal (price 1*s* 3*d* per issue) published by the Factory Department of the Ministry of Labour Each issue contains much of interest to all industrial first aiders who are concerned with accident prevention

Miscellaneous

33 Can you read a clinical thermometer? What is the reading on this one?

34 In our first aid box there are three kinds of tablet What are they and what are they used for? What is the dose of each of them?

35 Three of you have put a patient on to a stretcher Where would you stand? How would you do the job?

36 If four of you lift someone and you had only a blanket available how would you set about It?

37 If you were single handed how would you move an unconscious patient out of danger?

Having attended a course and passed an examination in industrial first aid will the first aider receive a certificate?

He should certainly do so The certificate issued by the Harlow Industrial Health Service to its trained first aiders is shown in *Fig* 72 Any first-aid course and certificate have to be approved by the Chief Inspector of Factories Such a certificate is valid for three years Thereafter the first aider must attend a refresher course and obtain a fresh certificate of competence

Books for Further Reading

What other books are of value to the factory first aider who is keenly interested in his job?

Health in Industry by Dr Donald Hunter of the London Hospital (Pelican Books) is a fascinating account of all aspects of industrial disease and its prevention Though technical it is easy to read But some excellent practical first aiders may find the science beyond their comprehension

First Aid to the Injured the little black book of the St John Ambulance Association was discontinued at the end of 1958 Though much of it is obsolete it still has one great value – its excellent photographs showing methods of transport of injured persons

First Aid the authorised manual of the St John Ambulance Association the St Andrew s Ambulance Association and the British Red Cross Society is now the standard text book of the three great national first aid teaching organisations It contains much theoretical physiological detail which we purposely omit On many subjects for example bandaging it is far more comprehensive than our teaching Its disadvantage is that it covers so much that the learner may become confused Nevertheless every intelligent first aider will find it an invaluable work of reference

The Administration and Training Manual of the British Red Cross Society contains an extensive and valuable section on the transport of casualties

Fundamentals of First Aid by Dr R A Mustard the official publication of the St John Ambulance of Canada covers much of the ground dealt with in this book It represents an original approach to the teaching of first aid It is however hard to obtain in this country

Occupational First Aid the St John manual for first aid workers in industry is complementary to this book and to the standard St John and British Red Cross first aid manual It does not deal with clinical first aid other than asphyxia in industry but has valuable chapters on industrial safety record keeping and industrial legislation

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